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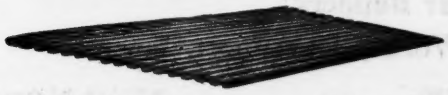

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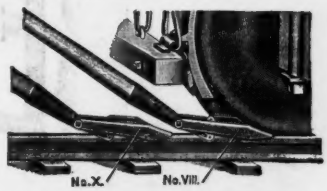

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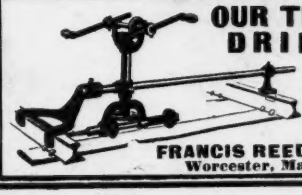

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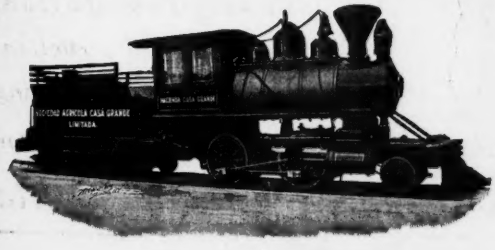

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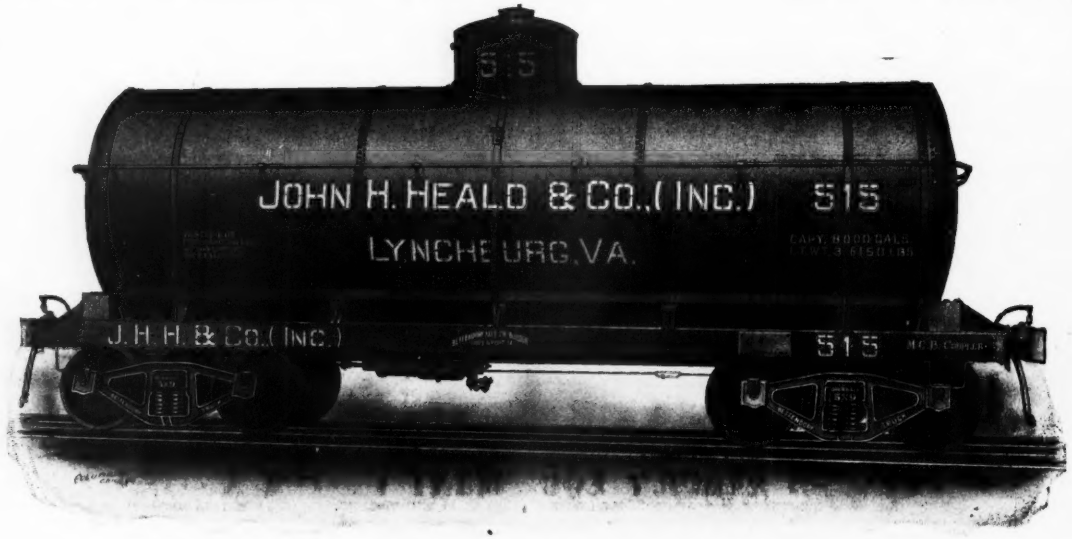

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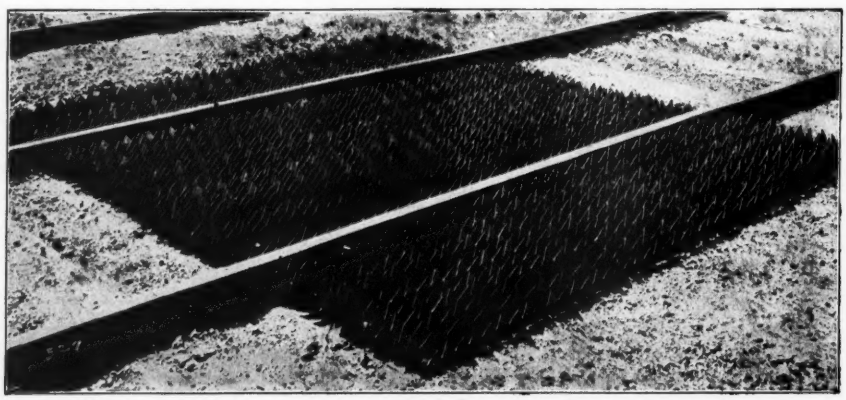

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APRIL

¶ The April Issue of Railway Engineering will contain a report of the Maintenance of Way convention, prepared so as to give the officials the important recommendations of the Association at a glance. Its publication will follow the closing of the convention and it will reach the official after he has returned home. Coming at such a time it will be of the greatest interest to him because he can refresh his memory if he attended, or if not inform himself of all that was done.

¶ The Maintenance of Way department of Railway Engineering is an important feature. Discussions by engineering officials on the methods of maintenance will keep our readers up-to-date on improved practice. The April issue will contain an unusual number of such discussions.

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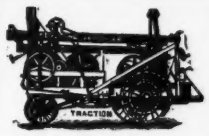

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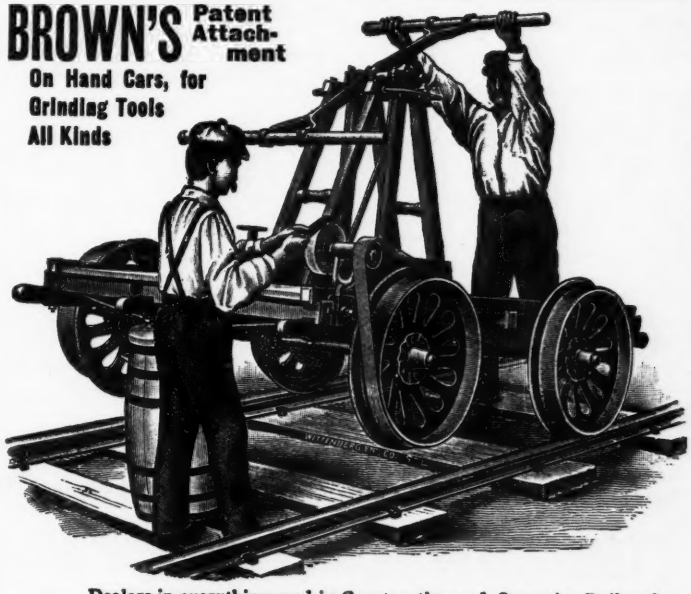

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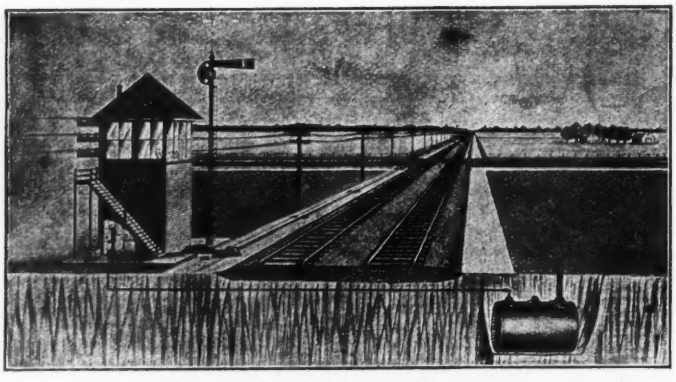

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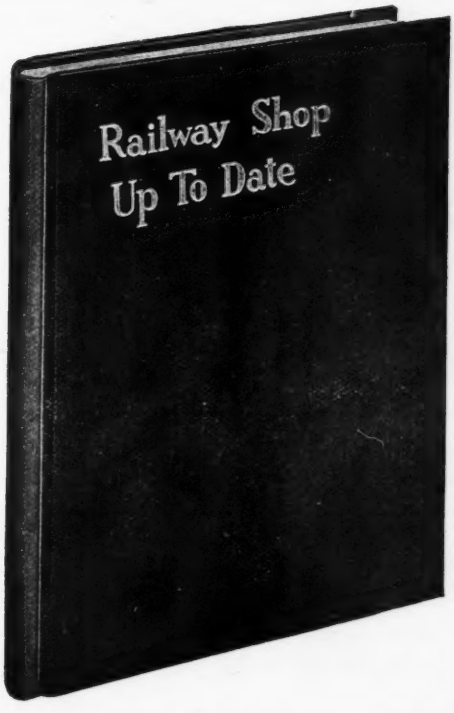

This is a book of nearly 250 pages 9x12 inches in size and filled from cover to cover with the practical every-day knowledge every railroad engineer ought to have. It has been carefully compiled from all that is known and has been written about the best and most representative railway shops in this country. Every large shop having up-to-date and valuable features, is described. Many of these shops are completely illustrated with cuts made from the drawings of the shops in the possession of the railroads. It is written in a clear and lucid style. It gives inside knowledge that is of inestimable advantage to every Engineer.

It is the best authority on railroad shop practice, construction and design published and ought to be in the hands of every man who expects to advance in his work.

This book is handsomely bound as you will note from the photographic reproduction shown herewith. It contains not only a vast amount of valuable information in regard to each of the big railway shops but also gives the kind of tools used in each and the best arrangement, with best practices and methods of construction and design. There is no doubt but that you will find many things in this book which will materially aid you in your work and by reference to it you will find improvements that can be made in your shop or your department that will increase its efficiency and capacity.

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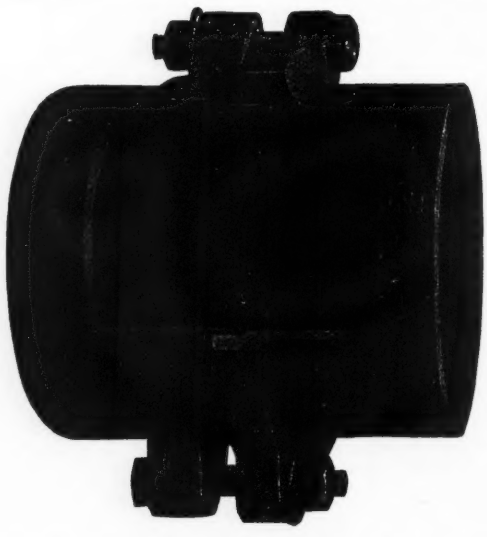

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Railway Engineering

and Maintenance of Way

Mr. William Doyle has been appointed assistant superintendent of structures of the Northern Railway, with office at San Jose, Costa Rica.

The title of Mr. A. J. Himes, assistant chief engineer of the New York, Chicago & St. Louis, has been changed to Engineer of Grade Elimination, and all employees in the engineering department connected with the work of eliminating grade crossings in Cleveland, Ohio, will be under his jurisdiction, and all questions relating to construction work involving train service and requiring action by the engineeringg department will be referred directly to the Engineer of Grade Elimination.

Mr. Louis C. Fritch, assistant to the president of the Illinois Central, has been appointed Consulting Engineer, in charge of electrification work, of the Illinois Central, the Indianapolis Southern and the Yazoo & Mississippi Valley, with office at Chicago, succeeding Mr. L. T. Moore, who continues as Chairman of the Board of Pensions. Mr. Donald Rose, general European agent, succeeds Mr. Fritch.

Mr. W. M. Post, Assistant Supervisor of Signals of the Pennsylvania, at Pittsburg, Pa., has been appointed Supervisor of Signals of the Chautauqua division, with office at Oil City, Pa.; Mr. G. E. McFarland, Assistant Supervisor of Signals at Altoona, Pa., has been appointed Supervisor of Signals of the Buffalo division, with office at Olean, N. Y.; Mr. J. H. Broadbent, Assistant Supervisor of Signals at Kittanning, has been appointed Supervisor of Signals of the Allegheny division, with office at Kittanning, Pa., and his former office has been abolished.

Mr. L. H. Long has been appointed chief engineer in charge of construction of the Cananea, Yaqui River & Pacific, with office at Empalme, Sonora, Mexico.

Mr. Robert Belton, roadmaster of the Atchison, Topeka & Santa Fe, at Florence, Kan., has resigned.

Mr. D. W. Hickey has been appointed foreman of construction equipment of the Chicago, Burlington & Quincy, at Galesburg, Ill., succeeding Mr. O. W. Duffy, resigned to accept service with another road.

Mr. George L. Moore, whose resignation as chief engineer of the Rutland was announced, has been appointed engineer of maintenance of way of the Lehigh Valley, succeeding Mr. R. G. Kenly, resigned.

Mr. W. H. Potter has been appointed superintendent of telegraph of the Southern Railway, with office at Washington, D. C., succeeding Mr. C. P. Adams, deceased.

Mr. James M. Reid, chief engineer construction of the National Lines of Mexico, has been appointed chief engineer of the National Railways of Mexico, with office at Colonia station, Mexico City.

Mr. O. Suthards has been appointed general tie and timber inspector of the Missouri Pacific, succeeding Mr. W. T. Schultz, resigned to accept service with another road.

Mr. J. B. Berry, chief engineer of the Chicago, Rock Island & Pacific, has been appointed also supervising engineer of the St. Louis & San Francisco, with office at St. Louis, Mo.

Mr. F. J. Marcheck, signal supervisor of the Houston division of the Galveston, Harrisburg & San Antonio, has been appointed district signal foreman of the Houston division. Mr. P. V. Wright succeeds Mr. Marcheck.

Mr. M. C. Byers, engineer of maintenance of way of the St. Louis & San Francisco, has been appointed chief engineer, succeeding Mr. J. F. Hinckley, resigned. The position of engineer of maintenance of way has been abolished.

Mr. Charles L. Gasper, mechanical engineer of the Wisconsin Central, has been appointed superintendent of the mechanical department of the Canton & Hankow Ry. at Canton, China, to succeed Mr. T. S. Reilly, whose death was recently noted. Mr. Reilly, who died of an abscess of the liver, has been buried at Hongkong, a British colony. Mr. Gasper will leave for China at once.

Mr. R. G. Cullivan, general foreman of the locomotive department of the New York Central at West Albany, N. Y., has been appointed division superintendent of motive power, to succeed Mr. E. A. Walton, resigned. Mr. Cullivan will be succeeded by Mr. Marvin Howe, general foreman of the locomotive department at Oswego, N. Y.

Mr. J. C. Garden has been appointed master mechanic of the Eastern division of the Grand Trunk, with headquarters at Montreal, in place of Mr. T. McHattie, who has resigned to take service with another company.

Mr. W. S. Kenyon has been appointed master mechanic of New Orleans & Northwestern, with office at Ferriday, La., vice Mr. B. J. Peasley, transferred to St. Louis, Iron Mountain & Southern shops at De Soto, Mo.

Mr. P. N. Jones, electrical and mechanical engineer of the Pittsburg Railways Co., has been appointed general superintendent of the company.

Mr. G. E. Johnson has been appointed master mechanic of the Wymore division, of the Chicago, Burlington & Quincy, with headquarters at Wymore, Neb., vice Mr. A. B. Pirie, assigned to other duties.

Mr. A. S. Work, road foreman of engines of the Chicago & Alton at Bloomington, Ill., has resigned, and Mr. James Butler has been appointed to succeed him.

Mr. C. B. Smyth, assistant mechanical engineer of the Union Pacific, has resigned to accept the position of superintendent of the McKeen Motor Car Co., with headquarters at Omaha, Neb.

Mr. F. C. Pickard, formerly master mechanic of the Mississippi Central, has been appointed master mechanic of the Cincinnati, Hamilton & Dayton at Moorfield, Ind., to succeed Mr. C. B. Cadman, resigned.

The Maintenance of Way Department

Cutting Weeds

Editor, Railway Engineering:

Grass and weeds are practically let alone on my division except as we do regular track work—then I have track cleared or grassed off ahead of each day's work. The track has only one weeding a season. I find the grass and weeds do no harm except at heavy grades in wet weather (causing engines to slip), but on the other hand the growth keeps down dust and makes travel more satisfactory.

My track is all cleared of grass and weeds with short handle shovels, by working men by the bar length or rail. Six men can average from half to three-quarters of a mile each day on sand or mixed ballast track, such as we have. This instruction holds good with my men during the season, except on wet days, when regular track renewal is not practical, then they grass ahead so as to have this part of the work completed when road bed is dry enough to take up regular work.

It has in former years been the rule to grass track three to four times each season, but I consider this useless.

Yours truly,

South Carolina. W. A. T.

Spiking and Gauging Track

Editor, Railway Engineering:

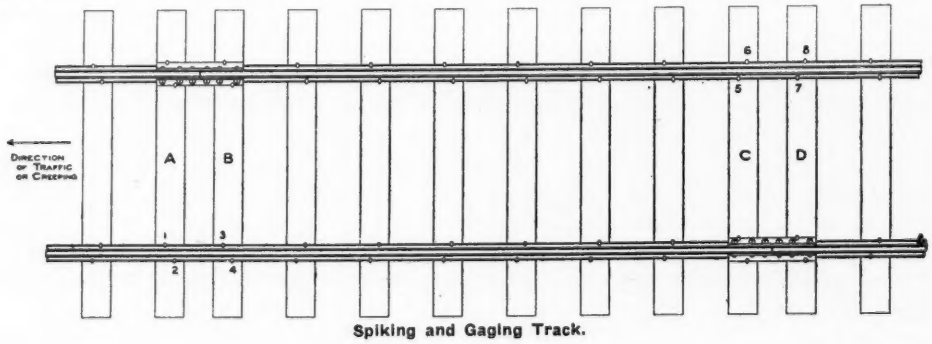
One of the most important details of trackwork is the proper spiking of the ties, which is essential in order to have good gauge and to prevent the rail from creeping, and this should be the aim of every section foreman. However, a proper spiking of track will not prevent rail creeping, if the ties are not properly spaced and the track is not properly ballasted, equally important factors wihch are often overlooked.

All the men in the gang should be taught to spike track; only the best men, however, to be used in spiking main track.

The line side should be spiked first; all spikes to be driven perpendicularly and under no circumstances are they to be leaned or driven sidewise after once being started, as this injures the fiber of the wood. After the line side has been spiked, the track is ready for gauging. Only the most careful men should be used for this work and the spikes set perpendicular to the tie, so that when they are driven the full depth, the gauge will so fit that if the track were turned with the bottom of the ties up, the gauge would not fall out. It is almost impossible to say how to do this work; each foreman must become acquainted with it himself and be able to judge of it from his own experience, one mattter of importance being that in all cases the gauge should fit with the same degree of tightness.

The two outside spikes should be on the same face of the tie and the two inside spikes on the alternate face. This is not only done to lock the tie against creeping, but to get as far away from the heart of the timber as possible.

In order to prevent creeping by spiking, the outside spikes should lead the inside spikes, on double track in the direction of train movement, and on single track in the direction of the creeping; the one exception to this rule to be noted is that the spikes on the joint tie opposite the splice on the engineman's side, in the direction of travel or creeping, to be reversed with the inside spike to lead the outside, and on the joint ties opposite the splice on the fireman's side in the direction of movement or creeping, the inside spikes should be on the same face as the inside spikes in the splice slots, and the outside spikes to be on the same face of the tie as the outside spikes of the splice slot. Probably a better way to explain this would be by a diagram, which is shown herewith. You will note from this that the joint ties "A" and "B" have the spikes "1", "2", "3" and "4" reversed from the general arrangement of spiking of intermediate ties. Also, that while the joint ties "C" and "D" have the spikes



Spiking and Gaging Track.

transposed from the general spiking of intermediate ties, the inside and outside spikes fall on the same side of the ties, respectively, because the splice bars are so slotted that the right hand spike in every case leads the left hand spike, and on the engineman's side this is always the lead spike, while on the fireman's side the reverse is true.

As to gauging: It is our practice to continually keep after the gauge just as we do after the line and surface—in other words, no attempt is made to leave the gauging until winter, when other track work cannot be done, for at that time of the year it is impossible to line the track with bars which means that a gang of five men at least must be used to do the work of gauging; two men and the foreman spiking the line side to gauge, which cuts unnecessary holes in the timber, the other three men following, one pulling spikes and plugging the holes with tie plugs, which holes should be fully filled up with tie plugs,

(Continued on page 63)

Engineering Equipment and Supplies
Concerning Roadway

Steam Shovels, Wrecking Cranes and Pile Drivers

The Bucyrus Company has built steam shovels of all sizes for the last thirty years and the principal types now being manufactured are the new 45, 70-C and 95-B.

The new 45-ton Buycrus shovel is of a recent design and embodies radical improvements over machines of this size previously built. That part of the boom subjected to the greatest strain is a double box-girder, which makes it much stronger than the booms on other shovels of this size. It is especially reinforced at the point where the heavy strains, due to rapid swinging, are imposed. The frame of the house is built entirely of steel, and the roof is of sheet steel over a heavy wooden lining.

The swinging of the boom is effected by independent engines, set on the car frame beside the main engines as on the larger shovels.

The front end of the car body is especially strengthened, the transom beam over the forward truck being of a new design, built up entirely of structural material. This shovel is equipped with a locomotive boiler of ample capacity, which takes water either from a duplex steam pump or from an injector.

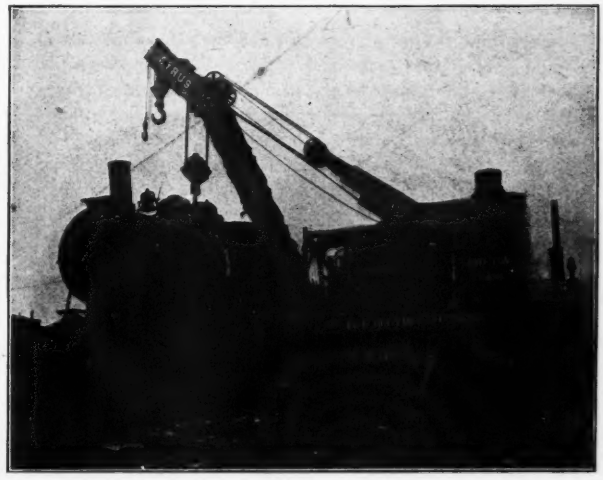
Practically all the castings except engine beds, cylinders and bearings are of steel, little cast iron being used. This includes pinions, gears and sheave rims.

This shovel is especially designed to meet the requirements of contractors and railroad companies desiring a strong and reliable shovel of less capacity than the 70-C machine, and has sufficient strength to enable it to handle shale or blasted rock. A great number of these machines are now operating successfully under the most exacting conditions.

The 70-C, carrying a 2½ or 3-yard dipper, combines the results of many years experience in the design and manufacture of shovels of this class. It is a strong, powerful machine, capable of digging all sorts of material, such as cemented gravel, hard rock or iron ore. Like the new 45, most of the parts of the shovel are steel, and, therefore, it is noted for its unusual ability to withstand the wear and tear that is such an important consideration in any excavating machine. The 70-C is equipped with 10x14 main engines, and is capable of excavating a cut 60 ft. in width at an 8 ft. elevation.

New 45-ton Shovel Working in Cut.

The 95-B Bucyrus steam shovel, carrying a 5 yd. dipper, is designed to meet the requirements of the railroad and mining companies, whose work demands the use of a shovel of highest power and strength. In iron ore or rock it has record output of from four to five thousand yards per day. The carbody is constructed of four 20 in. I-beams. The boom and dipper handle are of the combination wood and steel type. The dipper has a capacity of 5 yards with the shell ⅝ of an inch thick. The 14x16 hoisting engine is one of the largest and most powerful engines that has ever been put on a steam shovel, and the main hoisting drum is 36 ins. in diameter and takes the chain in a single layer, avoiding the over-wrappings, which for many reasons is undesirable.



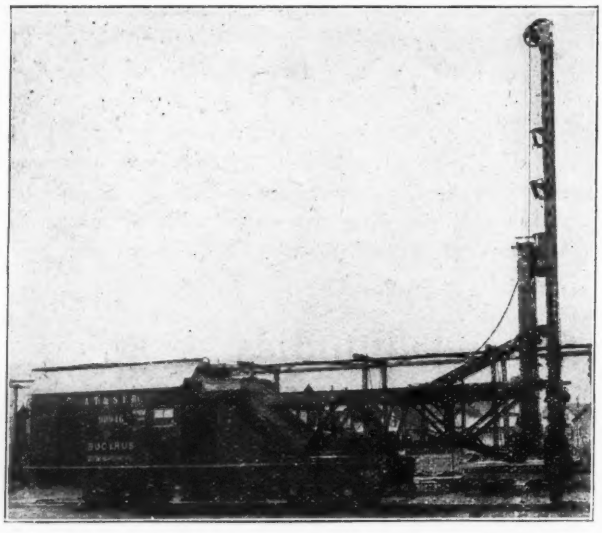
100-ton Wrecker at Work.

The gears are all cast blank and consequently the teeth are cut. The armoured boom is constructed of heavy oak timber and the top and bottom are reinforced by heavy steel straps ¾ of an inch in thickness, which are provided with turn-buckle take-ups that make it possible to always keep the steel and wood tight together, something impracticable otherwise on account of the shrinkage of the wood.

WRECKING CRANES.

The Bucyrus Company manufactures two wrecking cranes of 100 and 75-ton capacity. The features of these machines are as follows:

The operator stands in front, thus giving him a full view of the



Locomotive Pile Driver.

the operations of the crane instead of making him wholly dependent upon signals.

The 100-ton crane is equipped with three hoists of 100, 40 and 14-tons capacity, which are always ready for service, thus cutting out all reeving and unreeving of blocks.

The carbody is 22 ft. long, has a wheel base of 18 ft. 6 in., which enables closer action. This is made possible by the new type of pendulum end jack arms, which hang vertically at the corner of the car and can be pulled out into blocking position instantly by one man. Another remarkable feature of this crane is the fact that the jib may be raised while carrying a load. This is of the greatest advantage in the handling of wrecks, as in reaching out to a distance for a load, the jib is frequently lowered, so as to leave scarcely any room between block and block after taking hold. Both cranes are frequently equipped with self-propelling gear. This gear is operated by a friction clutch with sliding bolts at the truck axles which are to be withdrawn when the crane is handled by a locomotive, thus disengaging the entire gear and making it possible for the machine to be transported at high speeds and on short curves.

PILE DRIVER.

Special attention is called to the pile driver shown in the illustration. This machine is especially designed to run without the assistance of a locomotive. It is provided with a large locomotive type boiler, double cylinder engines located upon the main carbody and geared directly to two of the truck axles. The engine power and steam capacity are such that the driver is capable of propelling itself 15 miles an hour and hauling a load of 225 tons.

The machinery is mounted on a carbody about 40 ft. long, built of structural steel. Over the forward truck is placed a turn table about 8 ft. in diameter, and upon this turntable is mounted a swiveling frame, carrying the leaders and leader raising mechanism. The frame is so located that when set ahead, in line with the car, a pile can be driven 18 ft. ahead of the front wheels. The swivel frame when properly balanced, can be swung around to either side of the pile driver, in which position piles can be driven 19 ft. either side of the center of the track, or at any less distance. To enable the pile driver to work at either end, a special turn table is suspended underneath the car. When it is desired to turn the machine, a turntable is lifted by jacks attached to it so that the flanges on the track wheels clear the rails. The machinery can then be swung around end for end and lowered upon the rails.

The leaders can be raised from the lowest to the highest position in one and one-half minutes, and provision is made to slope them either sideways or fore and aft, to enable the machine to drive batter piles.

Ditcher and Clam Shell Bucket

The draining of the American railroad bed is a serious problem that the maintenance of way engineers are continually facing. However, there is a necessity of excavating and ditching along the side of the road bed at all times. The Browning railroad ditcher has done a considerable amount of work of this kind, and there are numerous machines of this nature working throughout the country. The accompanying view shows one at work in the state of Illinois. The machine is rapid, strong and efficient in all that it does.

The Browning ditcher is the smallest type of a revolving steam shovel built, and is fitted especially to be used upon the top of flat cars and to work through a train by loading the excavated material on the same cars. It is designed to be used in widening the cuts and opening up ditches. One road is using it during the winter months to handle coal and sand and like material at one of its shops. This is done by removing the dipper arm and using a bucket in its place.

The ditcher can be used on standard gage surface track, or on the portable track furnished. This consists of sections, each of which is made of two rails securely but lightly tied together, and with sling chains by which they are handled by the ditcher itself.

The lower traveling base or car body is formed of a single heavy casting, mounted on four special wheels. On top of each is fastened the large rotating gear and the turned roller upon which the upper base rotates.

The upper and lower bases are securely fastened together by means of a hollow steel center pin, through which is carried the vertical propelling shaft.

The upper, or rotating base which carries all the machinery, boiler, boom, etc., is also made of a single heavy casting. This construction is in every way superior to a built-up structure, as there is absolutely no possibility of the various parts working loose and throwing the shaft and other parts out of line.

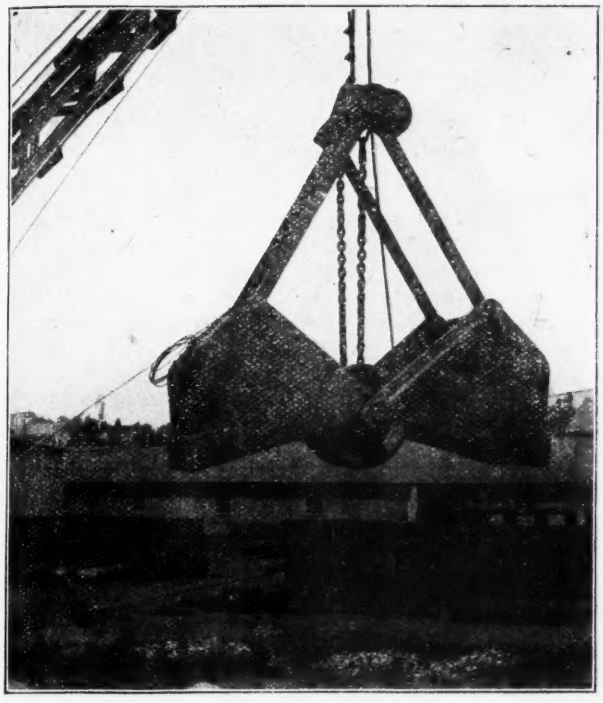
All the bearings are heavily bushed with hard bronze. All motions except the raising and lowering of the boom are controlled by means of the Browning all steel friction clutches. These are of the expanding steel spring type, and require practically no attention beyond keeping them oiled. All parts are of steel and are hardened and ground to exact size.

The ditcher carries its own coal and water and a syphon hose so that when the water is low it is able to fill its own tank. This ditcher will handle the dipper, swing it around and propel itself along the track at one and the same time when necessary. This machine is manufactured by The Browning Engineering Co., of Cleveland, Ohio.

BUCKETS.

During the past twenty years a great change has taken place in the method of excavating and the handling of sand, rock, dirt, gravel, mud, clay, coal slack, cinders, etc., etc. We will con-

Browning Ditcher.



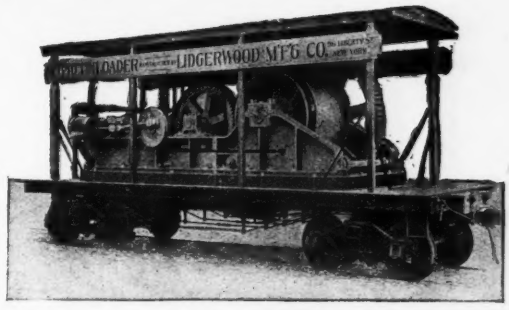
Browning Clam Shell Bucket.

fine ourselves here to a few words with respect to the automatic clam shell bucket. There are numerous buckets of this kind on the market, good ones and bad ones. Those of a poorer working ability are fast falling by the wayside and soon we will only have those of the very best qualities left. The Browning clam shell bucket has gained considerable prominence during the past few years for its strength, rapidity in movements, simplicity and its digging qualities.

One of these buckets used by the Buffalo & Susquehanna Iron Company of Buffalo, N. Y., has a calculative capacity of two cubic yards, but it is capable of handling about 2½ cubic yards of the material at one time. The view shows the general construction of this bucket. It is of the ordinary two-rope type for use in connection with locomotive cranes, whirlies, derricks, overhead trolleys and elsewhere. It consists of a yoke or head from which the bucket hangs. This consists of a solid casting, so constructed as to allow the bucket to hang vertically under all conditions. To it is attached the opening and lowering line, and it also carries a guide sheave for the closing or hoist line. The forged steel side arms are fitted with removable hardened steel bushings. The power drum, or wheel, upon which the closing or hoist line passes is of heavy iron or cast steel and is fitted with large bronze bushings. It runs loose on the shaft, which also acts as the hinge pin. In the larger sizes the sides are reinforced by means of a heavy cast steel hinge plate extending from the center hinge to the outside arm pins. The shell is made of the best steel plates riveted together. When hard material is to be handled the cutting edge of the shells are fitted with heavy cast steel shoes or forged steel teeth. This added weight greatly increases the digging power.

Lidgerwood Rapid Unloader

Direct and large economies in the handling of large quantities of excavated earth and rock have resulted from the use of the Lidgerwood rapid unloader. The records now being made in "making the dirt fly" on the great Culebra cut at Panama are largely the result of the use of the unloaders. There, as in many places, the problem was not so much "How to excavate and load" as "How to get rid of the spoils promptly." What is being done down there is indicated by this extract from the "Canal Record" of a recent date.



Lidgerwood Rapid Unloader.

"The seven Lidgerwood unloaders in the Central Division during the month of November unloaded a total of 1666 trains, composed of a total of 28,475 cars. Of this number, 574 trains, composed of 10,311 cars, were unloaded by the three unloaders at the La Boca dump, and 1092 trains, composed of 18,164 cars, were unloaded by the four unloaders at Tabernilla. As all the cars were of 20-yard capacity the material unloaded represented about 569,500 cubic yards."

It is a matter of record that in railroad building earth has been loaded, moved from 15 to 50 miles, unloaded and leveled for less than 4½ cents a cubic yard by the use of the "Unloader" system.

The Lidgerwood rapid unloader is both a machine and a system. The machine consists of a specially designed heavy "hoisting" or hauling engine mounted on a flat car and provided with flexible steam couplings to enable it to take steam from the locomotive. The unloaders are made of two sizes, the smaller with 10x12 in. cylinders and having a pull of 25 tons, and the larger ones with 12x12 in. cylinders and having a pull of 60 tons. These engines are placed at the head of the dirt trains next to the locomotive and a flat car with a plow aboard is brought to the rear of the train. The cable is taken back to the plow, the unloader engine started and the whole load of an ordinary 16-car train swept clean in about three minutes. By moving the train ahead or backward at the same time the earth can be spread out as thinly as required, or it can all be swept off at one place, as when needed for filling a washout or a ravine. A heavy spindle is provided at one corner of the unloader to guide the cable when the engine and cable are used for pulling track.

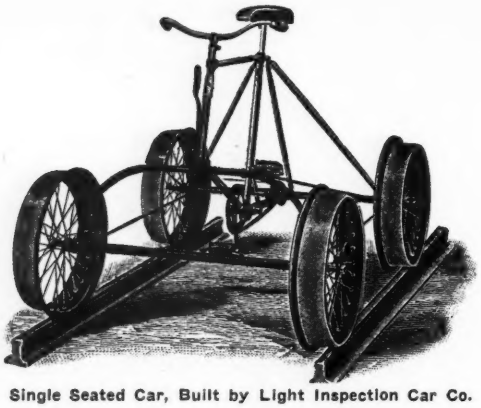
Lidgerwood cars are merely flat cars, either with or without swinging sides, provided with sheet steel aprons which reach from car to car so as to make a continuous platform for the plow to sweep over. Nearly 1300 Lidgerwood flats are in use at Panama. The plows may, of course, be either right handed, left handed, or double faced, so as to deposit the load on one side or the other of the tracks or upon both sides at once.

Concerning Track

Rockford Motor Cars

Motor cars effect economy in maintenance of way because they save time in going to and from work. Roadmasters and other track officials have become convinced through experiences which they have had or have witnessed. Where railroads are not furnishing cars, roadmasters have purchased cars on their own account.

The Rockford railway section car No. 4 is intended to take the place of the hand-driven cars now commonly in use. It is powerful, simple and reliable, having neither friction, gear, chain nor shaft-drive, and can be operated backward at same as forward speed. The brake is of the severe type on all four wheels, with brake operating lever on top of car in easy reach of the operator. Two four-cell dry batteries, waterproof spark coil and two-gallon gasoline tank are supplied with each car, unless otherwise specified. The speed of car



Single Seated Car, Built by Light Inspection Car Co.

is from 3 to 30 miles per hour and weight complete is 650 lbs.

The Duntley Manufacturing Company, Chicago, builds many designs and sizes of Rockford railway section and inspection gasoline motor cars.

Light Inspection Car

The accompanying illustration shows a single seated car built by the Light Inspection Car Company. This car is built for any gauge track from 18 in. to 6 ft. When made for standard (4 ft. 8½-in.) gauge or wider the machine is arranged so that the front axle and wheels fold back under the car, thus reducing the space occupied in storing or shipping. Folding is not often required, however, as the car will pass through the door of a baggage car without folding. As the width is less than the wheel base in cars of less than standard gauge no provision is made for folding them.

These cars are claimed to be safe and strong, but the rigidity of frame and endurance are increased as the gauge is narrowed. This adapts the cars especially to rough logging, mining and mountain railroads which abound in steep grades and sharp curves.

The cars are geared to suit grade conditions. The standard gear is 62, but 52, 58 or 73 are furnished.

The net weight of this car complete is 65 pounds, and created for shipment it weighs 100 pounds.

Track Cars

Ten different modifications of hand cars adapted for various classes of railroad uses are made by the Fairbanks, Morse & Co. They are all equipped with pressed steel wheels, with turned over M. C. B. flange. The axles are made with tapering ends and the hub of wheels also bored tapering, so that when the wheel is put on the axle, the screwing up of the nut will serve to make the wheel fit tightly on the axle without the necessity of keyseating. All our gear wheels are machine cut so that the teeth are all an exact size and shape, and perfectly smooth. This materially reduces the friction and wear on these particular parts, and makes the cars much easier to propel than when the ordinary gears with cast teeth are used. A forged steel walking beam or lever, fitted with carefully selected rock elm handles, is also used. The gallows frame is braced by iron rods, both vertical and diagonal, and when once properly placed in position will remain absolutely rigid during the life of the car. The sizes of the platforms of the hand cars vary from 6 to 8 ft. long and from 4 ft. 4 in. to 5 ft. 8 in. in width. All cars are equipped with foot brake.

PUSH CARS.

Two sizes of push cars are made, one for regular section use, the other considerably heavier and intended more for service during the construction of roads, when push cars are often called on to handle much heavier loads than under ordinary conditions. A selected grade of hard wood is used in these cars. They are also equipped with pressed steed wheels. The lighter car has a safe carrying capacity of 4000 lbs., and the heavier car of 8000 lbs. The platforms are practically the same size in both cases; that is, 7 ft. long by 6 ft. 6½ ins. wide. The lighter car weighs 500 lbs., and the heavier one 710 lbs.

TRACK LAYIHG CARS.

This is a heavy car designed for use in track laying. It is made in capacities of ten and twenty hundred pounds. At each of the four corners of the car is placed a hardened steel roller to facilitate the loading and unloading of the rails. These cars are equipped with heavy cast iron wheels 16 ins. in diameter, with chilled tread. The lighter type of car weighs 1360 lbs., and the heavier one 1550 lbs.

VELOCIPEDE CARS.

Six modifications of velocipede cars are arranged for carrying from one to three persons. These can be subdivided into wooden frame cars and steel frame cars. The former are heavier, but have the advantage of standing more hard usage and abuse than those made from steel tubing. All velocipede cars are equipped with ball bearings. The steel wire spoked wheels with rubber tires. They are all extremely easy to propel. These Sheffield velocipedes have been on the market for something over 25 years.

GASOLINE MOTOR CARS.

These are made in various sizes carrying from one person up to 35. Our No. 10 is the smallest car made, and is built after the style of the one-man wooden frame velocipede car. It is equipped with a small air-cooled motor, taking up little room, and which develops 2¼ horse power, sufficient to give it a speed of from 12 to 15 miles per hour, under ordinary conditions. The car complete weighs a little over 200 lbs. It is used extensively by signal men, telegraph line inspectors, etc.

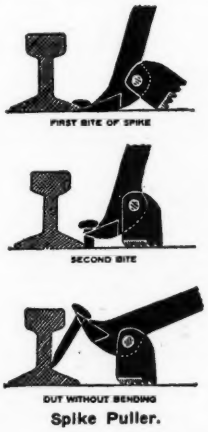
The No. 2 four-wheel car is a very popular design. It has seating capacity for three persons, weighs about 375 lbs., and a speed of over thirty miles an hour can be attained. It is equipped with double cylinder air-cooled motor.

The other and larger types of four-wheel cars are intended for carrying section gangs to and from work, inspection, and for carrying passengers on interurban branch lines.

Spike Puller

The Justice spike puller, made by Philip S. Justice & Company, is shown in three positions by the accompanying cut. It is operated as explained below.

In pulling spikes where the head is not easily taken hold of with the claws, instead of punching the puller at the spike as is done with the ordinary claw bar, place the claw end of the bar against the spike, then raise the handle up almost straight until the foot piece falls into place, then move the handle



Spike Puller.

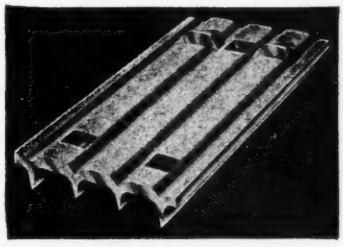
back and forth from 2 to 6 inches until the claws are pushed on to the spike, as this movement works the claws under the heads of spikes, then pull back the foot piece, bear down on the handle and make "first pull" same as with claw bar. Now throw up the handle and the foot falls into place, then bear down and the spike is out without bending it. This plan does not dull the points of bar or damage the spike and the latter is pulled easily in one-half the time.

This manner of pulling hard spikes with this bar is one which you should know in order to get the full benefit of the tool.

Tie Plate

The tie plate, shown herewith, is a two shoulder plate with ½-in. shoulders and it is 5 ins. wide and 3-16 or ⅜ ins. thick. The advantages claimed for the Wolhaupter shoulder flange tie plate are as follows:

First, it has maximum strength for weight of metal used;

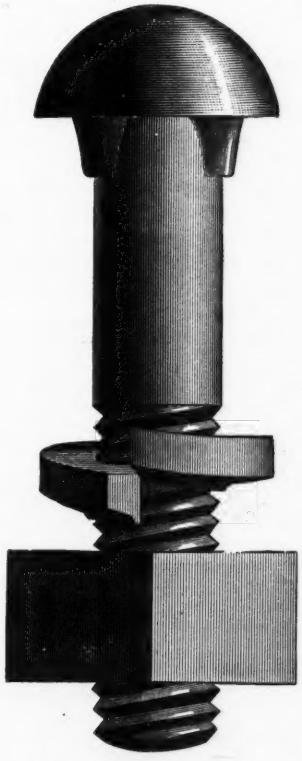


Wolhaupter Shoulder Flange Tie Plate, Railroad Supply Co.

Second, the half-inch high shoulders prevent shearing of spikes and spreading of rails;

Third, the flanges prevent motion between plate and tie and give maximum resistance against lateral thrust of rail, and

Fourth, when properly imbedded it does not destroy the tie.



National Ribbed Lock Washer.

Eccentric Rail Bender.

Rail Bender

The Pittsburg eccentric rail bender, built by the Pittsburg Pole & Forge Company, is made of forged steel with machine cut specially cut thread steel screw having right and left hand collar. This bender is a compact and simple device for bending and straightening tee and girder rails from 40 to 110 lbs.

Lock Washers

The lock washer, shown herewith, is used on all kinds of work. It is used extensively on tracks, bridges, frogs and switches where it is desirable to keep the nuts tight. It is made of steel, hardened in oil and tempered.

When nut is screwed up on bolt, it first strikes rib on lock washer, which, being harder than the nut, progressively upsets and forces some of the metal of nut into thread of bolt, positively locking nut, so that it cannot back off or jar loose.

Plain nut locks are nut holders to the extent of the spring and no more. The National, however, when set up holds nut tight independent of the spring, and besides has all the spring possible, which takes up elongation of bolt or looseness caused by settling or wear. When on track this lock washer is so imbedded in nut that there is no friction between it and nut as wheels pass over joint; it will, therefore, wear long, and tests have demonstrated that its use prolongs the life of the joint. It can be used on any make of bolt or nut, a special bolt and nut not being necessary. Same bolt, nut and lock washer can be used as often as required. It is made by the National Lock Washer Company.

Paulus Track Drill

The Paulus automatic feed track drill is shown in position for drilling. The operation of same is given as follows:

To set up the drill for operation put handle back between braces and throw the upright part of the drill down. Throw the hooks over the rail, then straighten up the brace and bring the drill to an upright position. Screw ratchet wheel with hand and tighten the bit up against the rail where you

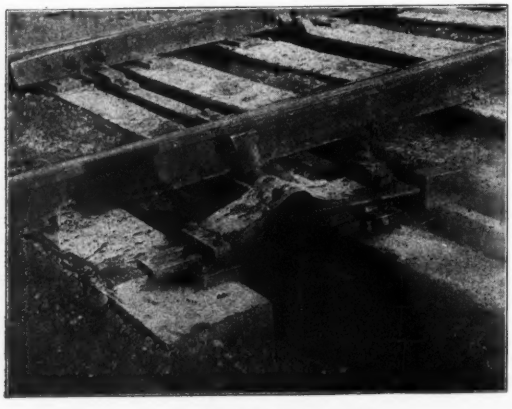
Paulus Track Drill.

wish to bore the hole. Stand on the foot plate when drilling. Never turn the handle backward to take out the drill bit. Throw down the upright part and remove the hooks from the rail. Pull the machine back to take the bit out of the hole. For train to pass when boring, throw the upright part down and the hooks back. Keep the screw in the end of feed screw set up tight to insure easy work. It is well to have a strong solution of soap and water dropping on the bit when drilling.

Latimer Switch Point Lock

The Latimer switch point lock was invented by Mr. James B. Latimer, signal engineer of the C. B. & Q. R. R., who felt the necessity for a device to protect facing point switches on main line.

The switch can only be locked when the lever is down, and the points cannot be unlocked without the lever standing in an upright position, thereby calling attention to the fact. It is impossible to lock the points unless they have been brought close up to the stock rail. The lock also insures against accidents to the switch stand. There have been many serious wrecks on this account, which the Latimer switch point lock would have obviated.



Latimer Switch Point Lock.

No. 15 Claw Hydraulic Jack.

Claw Hydraulic Jack

The claw hydraulic jack illustrated is made by A. L. Henderer's Sons. The claw on this style is close to the ground, so as to raise loads that are not of sufficient height to admit the head of jack. It will run out horizontally about its entire lift and the entire rise may be attained by slightly raising the head to keep pump submerged. The claws are of steel. This style is made in sizes of 4 to 40 tons, 12 and 18-in. rise.

Ball Bearing Jack

The Norton ball-bearing ratchet screw jacks are constructed on a different principle from other jacks. They have a stationary standard and sliding-sleeve fitting over the same. The standard has a removable nut (phosphor bronze) fitted within it and resting on a shoulder in which the screw turns. The standards are hollow and can be filled with oil, thus keeping the screw constantly lubricated. To the uppper end of the screw is fastened a steel gear; a hardened tool steel plate encircles the hub and rests on the body of said gear, on which are placed circular trains of hardened steel balls, held in place by rings between the rows, as shown in cut. In the top or head of the sliding-sleeve, which is bored to fit standard, is placed another hardened tool steel plate, with a hole in the center, through which the end of the screw projects.

When the jack is assembled the sleeve slides down over the screw and standard, the bearing plate in the head resting on the balls (between the steel plates), which act as a thrust-bearing between the screw and head of sleeve, reducing the friction and increasing the lifting power of the jack.

The sleeve which revolves on the standard, allowing the lever to be used from either side, carries the load, and is raised or lowered by the screw, which is turned by means of a gear on the ratchet shaft engaging with the gear on the screw, and operated by a reversible ratchet and lever having the up and down "pump-handle" motion. The sleeve at the

Ball-Bearing Jack.

lower end is provided with a "stop-dog" or pawl, which prevents the screw from being run out of the nut.

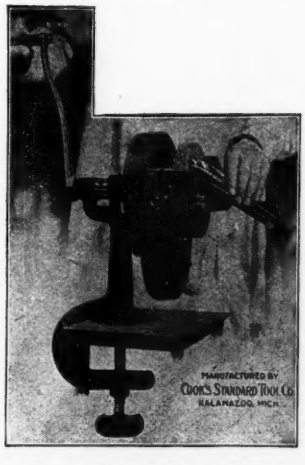
Barrett Trade Jacks

Many types and styles of jacks are manufactured for track work and for special conditions arising in that connection. Besides the well known regular Barrett track jacks, the Duff Mfg. Co. makes a special track jack with a foot-lift operating on the side of the jack, which permits the operating lever or handle to operate parallel to the rail. This is a decided advantage where a track jack is obliged to work close to a platform or obstruction or in a tunnel or on a bridge, or in fact any place where it is not possible to work the ordinary type of track jack on account of the handle extending too far and against these obstructions. With the handle operating parallel with the track this difficulty is overcome and permits the jack to be operated on the outside of the rail, and also permits the jack to be operated in close quarters.

Barrett Track Jack.

The Duff Mfg. Co. also offers a specially low track jack particularly designed for third rail or electric service. This jack being short size and specially low, when dropped, a locomotive and entire train may pass over the top of it without difficulty. The top of the lifting bar of this jack is always 2 ins. below the lowest point of the train or engine, and in operating this jack it does not require the use of flagmen for ballasting or surfacing the track.

Many other sizes, adapted to special requirements of railroads are built. Barrett Jacks are exclusively made by this company and have for twenty-five years been used on American and foreign railroads in both track and car departments.



Cook's Tool Grinder.

Ground Lift and Broad Base Jacks.

Reliance Hydraulic Jack

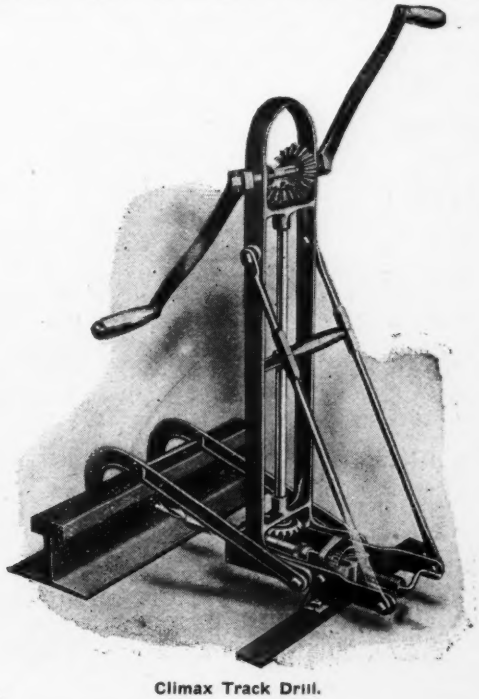
Reliance hydraulic jacks, built by Philip S. Justice & Company, are shown herewith. Fig. 1 is the broad base pattern and Fig. 2 is the ground lift pattern. They are controlled in lowering by thumb screw and they will work horizontally. They are simple in construction, are easily overhauled and the valves can be reached without disturbing the working parts. The broad base pattern is built in sizes from 10 to 50 tons and the ground lift in sizes from 10 to 40 tons.

Track Drill, Tool Grinder, Jack and Cattle Guard

The Climax track drill is equipped with crucible steel gears. The hooks are of forged steel and are of such shape that a hole can be drilled within half an inch of the end of the rail. They are adjustable so that a hole can be drilled through a fish plate or back of a guard rail or Weber joint without trouble. An adjustable set screw always brings the hooks automatically to the proper place on the rail. Passing trains are cleared by simply breaking the joints and throwing back the hooks, leaving the drill in place. The thrust of the bit is not carried by the feed device, but by a large nut imbedded in the frame. This permits the feed device to revolve easily and prevents grinding friction. This also permits the bit to be run forward and returned instantly, independently of the cranks.

TOOL GRINDERS.

Cook's standard tool grinder is a light portable grinder which can be attached to hand cars, bridge planks, etc. It is equipped with a carborundum wheel which revolves at 3500 r. p. m. With this grinder a tool can be given a keen edge in a moment's



Climax Track Drill.

time without the least possibility of heating it and destroying the temper. The face of the wheel is quite coarse for quickly bringing blunt tools to an edge; while the side of the wheel is very fine and is used for small tools and giving a keen edge. The gears and carborundum wheel are encased in separate compartments, thus preventing the dirt and grit from cutting the bearings. Completely protected by an iron shell. An attachment is supplied for holding twist and flat drill bits which automatically gives the bit a bevel clearance and a cutting edge that are perfect.

TRACK JACKS.

Cook's standard car and track jacks are made of malleable iron and steel. The track jacks are of both single and double acting types, and when the load is raised the jack is immediately dropped by means of a very simple and positive device. The car jacks are of both single and double-acting types and are lowered as they are raised, the movement being controlled by a large thumb nut on the side of the frame.

CATTLE GUARDS.

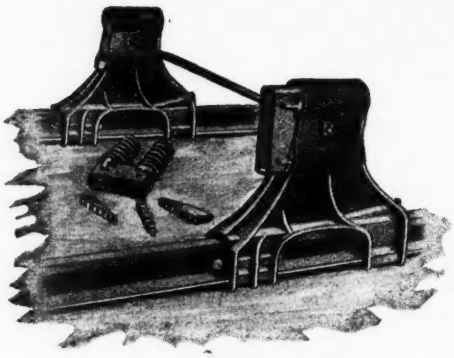
The standard Cook's wood-steel guard is made of a good grade of white oak. Resting on crossbars of steel the slats are fastened to the frame very securely by means of clamps, which may be tightened when necessary. No pit is needed; the guards simply resting on the ties, forming a durable, efficient and economic guard. The standard all-steel guard is formed of thin strips of steel standing on edge with teeth somewhat like those of a saw. This guard under pressure will quiver in such a way as to furnish no foothold whatever, making it practically impassable.

Bumping Posts

In making all metal, spring bumping posts, the manufacturers, John M. Scott & Sons, of Racine, Wis., have built the Hercules and Little Giant posts just as strong and substantial in every way as is possible, and the results have been very gratifying.

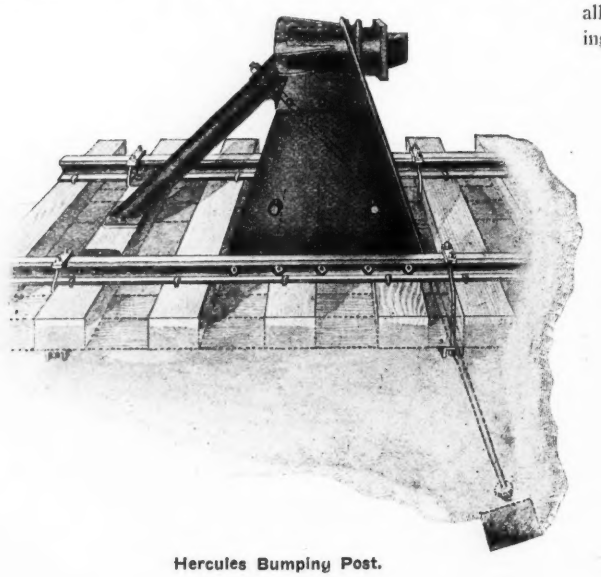
The Hercules is anchored very securely by means of a 1¼ U-bolt holding over the top of the cylinder and extending 5½ ins. into the ground, where it is anchored to a tie—the larger the tie the better the anchorage; the six large coil springs back of the striking plate have a capacity of over 100,000 pounds, and the horn on the face of the striking plate closes the couplers and prevents damage of both cars and post; crushed stone or other good rock ballast is recommended to get the full strength of the post.

The Little Giant post will hold to the full strength of the rails it is placed on, and so far the manufacturers have not been called upon to replace a single broken part of this post. It is very easily installed, as one man can place it on the track in less than an hour, there being no anchor pit to dig and no work to do upon the rails. The Little Giant has four large coil springs, two in each leg.



Little Giant Bumping Post.

The Hercules No. 2 is in course of construction, and is the same as the Hercules above mentioned, except that the springs are not used and, besides the 1¼-in. U-bolt, the 1¼-in. brace-rod will be extended downward and fastened to the same tie that anchors the U-bolt.



Hercules Bumping Post.

Concerning Buildings

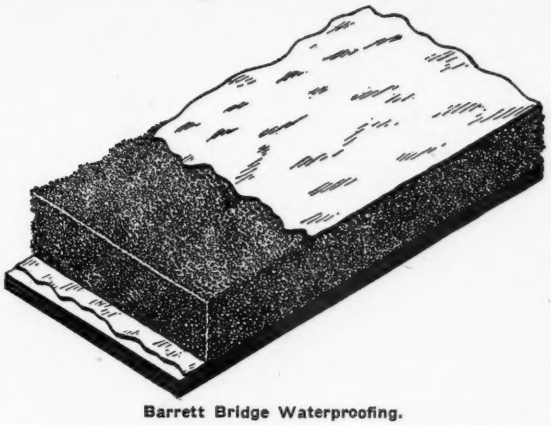
Asbestos Protected Metal

A building material of particular interest to those who have devoted time and thought to the subject of the destruction of railway and manufacturing buildings through attack of rust and fire is that of the Asbestos Protected Metal Co, of Canton, Mass.

The product is a material for use as roofing, siding, interior sheathing, etc., in buildings of various classes. This material is composed of a core of annealed sheet steel which is heavily coated with a special compound of an asphalt nature rendered practically non-inflammable. Firmly embedded in this compound on both sides of the sheet is a layer of asbestos felt.

The process of manufacturing this material indicates the thoroughness of the protection which is rendered to the metal core. The application of the compound is made through the immersion of the steel sheet in a bath of the compound maintained at a temperature of 400 to 500 degrees Fahr. This temperature tends to expand the minute pores of the surface of the steel sheet allowing partial penetration of the compound and a perfect sealing of these pores. The material is next passed through sets

Coaling Plant, Asbestos Protected Metal.



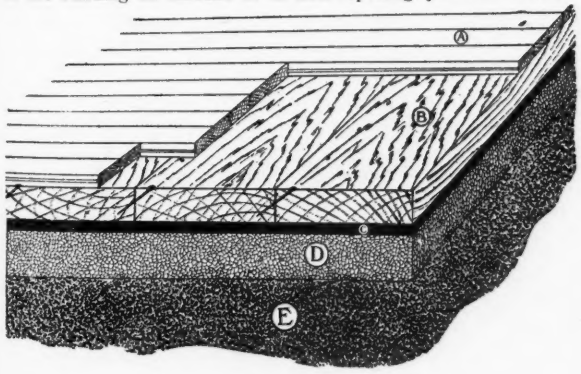
Barrett Bridge Waterproofing.

of heated rolls which remove the surplus compound adhering to the steel and rendering the coating even and of a thickness approximately one-twentieth of an inch or equal to about four coats of paint. While the sheet and compound are still at high temperature, asbestos felt is applied on both sides and the whole is then passed through heavy rolls which crush the asbestos into the compound, allowing the latter to partially saturate the fibres upon the underside of the asbestos felt. This combined sheet is then very gradually cooled under heavy pressure, the result being that the component parts, viz., steel, compound and asbestos, gradually contract and harden into a homogeneous whole.

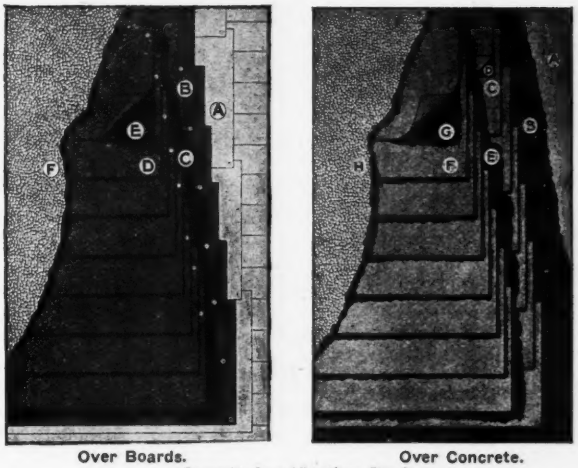
The real value of the method of protection thus described must appeal to every practical man. The strength and rigidity combined with the lightness obtained in the steel sheets have rendered them popular for use in construction of and protection of a large proportion of railroad buildings, but owing to the inefficiency of the methods of protection of steel against rust and corrosion heretofore known, the use of steel sheets has never been looked upon as wholly satisfactory or economical. In asbestos protected metal all the lightness, toughness, flexibility and rigidity of the sheets is retained permanently. On account of the toughness and acid-resisting qualities of the compound and the natural water-resisting, non-rotting properties of the asbestos fibre, not only is protection against attack of water and fumes from without a building provided for but the sheets being identical on both sides, the under or inner surface is also immune to deterioration.

Asbestos protected metal is manufactured in standard sizes of flat and corrugated sheets, beaded siding, ridge capping, etc., and is so tough and flexible that it can be used for flashings and trimmings in every form of construction.

The material is produced in two brands, one of which has an absorbent surface, the other a glossy waterproof finish. The former is used for interior fireproofing, etc., and for exterior use when painted; the waterproofed surface gives a permanent finish which is effective in reducing the summer temperature within the building on account of its heat-repelling qualities. For the



Barrett Tar Rok Sub Floor.



Over Boards. Over Concrete.

Barrett Specification Roofs.

fireproof covering of buildings for fume-resisting construction in and about terminals, coaling plants, foundries, chemical plants, a very wide field is open to this material.

Roof and Floor Construction

The Barrett Manufacturing Company will exhibit in the Coliseum, Chicago, at the time of the Maintenance of Way convention, something new in bridge waterproofing.

Roofs built up of coal tar pitch, tarred felt and gravel or slag, Barrett specification roofs, are illustrated herewith.

A method of insuring absolute protection against decay, where wooden floors are required on the ground without air space beneath, is also diagramatically shown.

Roofing Materials

Reinforced corrugated asbestos roofing or siding, asbestos Century shingles and asbestos Century lumber are handled by the Franklin Manufacturing Company. They have the exclusive right to manufacture asbestos lumber smoke jacks under the Gutelius patent. These products are made from 85 per cent. Portland cement and 15 per cent. asbestos fiber, and the flat lumber and shingles are put down under hydraulic pressure, thereby producing a material that is mechanically perfect and uniform in thickness and form. The cor-

Reinforced Corrugated Roofing Material.

rugated material is reinforced with a ¾-in. woven wire netting insuring the greatest strength both lineal and transverse. These materials are unexcelled for roofing, sheathing and lining of all classes of railroad buildings such as freight houses, train sheds, stations, piers, power houses, roundhouses, etc., as the material continues to vitrify and improve in quality with age and exposure and requires no paint or other attention after being applied, as the moisture of the atmosphere insures their indefinite preservation.

Waterproof Paint Compound

Flexible compound is a waterproof and acidproof liquid for paints and varnishes, and for waterproofing fabrics and textiles. No 75 Flexible Black enamel is a black baking japan, that resists high acids, is a high insulator and stands extreme heat. It is made by the Flexible Compound Company.

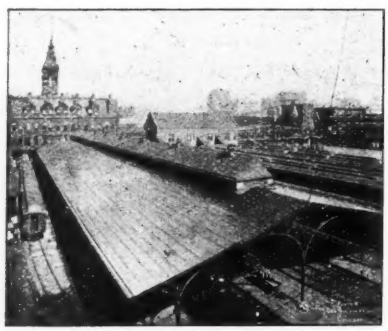
The Flexible compound is an oil product. It is not a paint

or varnish. It is garnet in color, about the same body as linseed oil, is absolutely pure, free from benzine and cheap oils, is a binder superior to linseed oil. It fills the long felt want of a perfect paint binder and thinner. It overcomes disintegration, fading of colors and loss of gloss.

Paroid Roofing

The question of securing a suitable roofing fabric that will adapt itself to all styles of railroad buildings and combine efficiency, durability, ease of application and perfect waterproof qualities is one that has vexed railroad engineers for many years. In every railroad system there are places where built up tar and gravel, slate or tile roofs cannot be used either because proper skilled workmen to apply them are unavailable or because the pitch or shape of the roof is such that they are impracticable, consequently there is a large and fast increasing demand for so-called prepared roofings.

One of these prepared roofings, known as "Paroid," is made by F. W. Bird & Son of East Walpole, Mass. Having been on the market for a good many years and having successfully stood the test of time it has been adopted as standard by several of the largest railroad systems in this country. It is made from high grade wool felt, thoroughly saturated with a non-volatile waterproof compound and finished on both sides with a coating that is impervious to water.



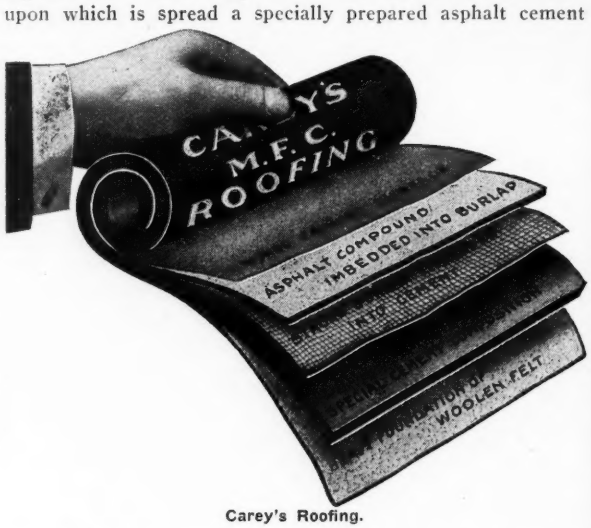
Showing Use of Paroid Roofing.

Paroid roofing is very plastic and can be applied in zero weather without the necessity of warming prior to application. It will not run under extreme heat conditions nor grow brittle and crack with cold. It comes with complete fixtures for proper application of the roofing (including the new square, rust-proof caps) packed inside the core of the roll, together with proper instructions for application. The cement furnished for the laps requires no heat to melt it, and can be applied with a brush like paint. Paroid comes in rolls containing 216 sq. ft., or sufficient material to cover two squares of roof surface.

F. W. Bird & Son, established 1817, are among the oldest manufacturers of roofing and waterproof building papers in this country and have a well deserved reputation of turning out nothing but the highest grade product. They maintain branch offices in New York, Chicago, Washington, Hamilton, Ont., and Winnipeg, Man., and have stocks and representatives in almost every large city in the United States and Canada. They also manufacture the famous Neponset waterproof insulating papers for refrigerator cars, cold storage and ice houses.

Carey's Roofing

Carey's roofing is a practical and substantial roofing material, which has been in constant use on buildings of every description for over twenty years. In construction this roofing is unique and entirely different from other forms of roofing materials. The heavy woolen felt serves as a foundation upon which is spread a specially prepared asphalt cement



Carey's Roofing.

composition—an invention of the Carey Company—into the surface of the cement composition is firmly imbedded a strong Calcutta burlap, and into the meshes of the burlap an asphalt compound—the combination being firmly rolled into a compact, flexible and absolutely water-proof sheet—twenty-nine inches wide, and forty-five feet in length, which is put up in rolls ready for application to the building. The weight of the roofing is ninety pounds per roll or square with the materials for its application.

The roofing is applied over ordinary sheathing laid closely —the same as used for tin or slate roofs—is equally adapted to either flat or steep surfaces, and for use on any kind of building requiring a substantial and practical roof.

It is proof against rust or decay. The composition remains in a flexible state under all conditions of exposure, cannot dry out nor crack and break, an advantage which time-tests prove that it possesses.

The roofing is used largely by railroads for round houses, shops, stations, and in fact, all classes of buildings. It is a roofing containing a high-grade of materials and is constructed in a manner so that its life can be perpetuated to last at least twenty-five to thirty years. The general offices and factories of the Philip Carey Company are located at Cincinnati, Ohio.

Slate Roofs

Until a spark arrestor will have been devised that will effectually stop all sparks, and until every steam locomotive will have been equipped with it, there will be fires caused by sparks from locomotives. It is, therefore, very desirable that all buildings within the spark zone of railroad tracks, be of fire-resisting construction, particularly that part of the building which is exposed to the spark showers, namely, the roof. This is one of the principle reasons why slate is used so widely on railroad buildings, and buildings near railroad tracks.

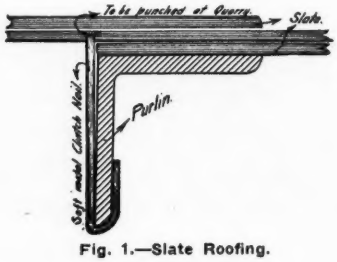


Fig. 1.—Slate Roofing.

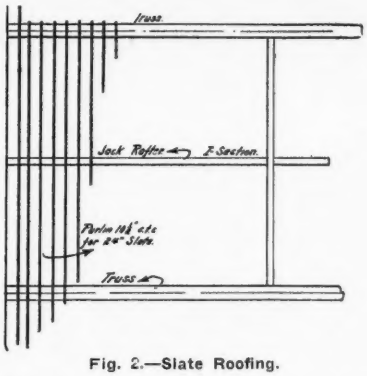


Fig. 2.—Slate Roofing.

A book of Building Construction says: "In a locality where the nearness to other structures makes flying sparks a menace, the question of a slate roof is not to be considered lightly. In such cases, it is unequalled by any other material."

Fire resisting is not the only commendable feature about Genuine Bangor Slate Co.'s slate. It is also smoke and fume proof; that is, the gases will not disintegrate it, as is the case with metallic or other prepared roofings. Being mineral throughout, this material does not rust or decay. It outlives the building without paint or repairs, and, therefore, it is the most economical roofing on the basis of cost per square per year, for the life of the building.

In fire-proof constructions for train sheds, stations, etc., it is now the custom to omit sheathing and fasten the slate direct to purlings, as shown in Fig. 1. In this method of construction, when the trusses are spaced more than ten feet, center to center, jack rafters are employed, as shown in Fig. 2.

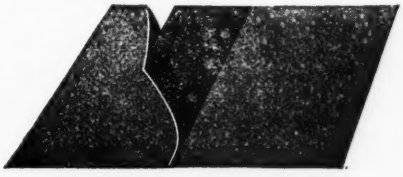
Asphalt Roofings and Paint

Asphalt roofings and paints have been manufactured by the National Roofing Company, Tonawanda, N. Y., nearly twenty years. The materials are especially refined in their plant, and the formulaes are proven by years of experience. Among the special features of their roofings are the following:

They are absolutely free from all forms of coal tar; they contain the highest grade of asphalt; unusual fire resistance; attractive appearance; they do not need painting or coating; nail heads covered by patented 6-in. joint; joint never leaks, and easily applied by anyone. The accompanying cut shows the 6-in. joint on their Security brand.

In the paint line, a complete list of roofing paints for use on metal, felt and wood surfaces, including a line of very high-grade color paints for use on any of those materials is made. They believe that they are the first manufacturers to produce a paint in colors, which works successfully on felt and rock surfaced roofings, giving them the desired protection from the weather, as well as an ornamental appearance in harmony with the color scheme of the building.

The Protec-Stac paint is of particular interest, where a durable paint for stacks, boilers and other hot machinery is wanted. In addition an asphalt graphite paint, which a number of the railroads are using, is manufactured.



Six-Inch Joint Security Brand.

One of the principal paints for felt roofings is the Asphaltus Coating, which is a heavy-bodied pure asphalt and oil coating, furnished in black only. This coating adds a good many years to the life of any smooth or surfaced felt roofing.

Water Columns

The difficulties resulting during freezing weather, from joints which require packing or adjustment, make the device shown in the cut especially interesting to engineers and men in railway water service.

This joint is unique in design, entirely original with the U. S. Wind Engine & Pump Company, of Batavia, Illinois, and a decided departure from old methods. It is a circular or flange joint set at forty-five degrees in the spout pipe. This enables the spout to be raised and lowered without uncovering any part of the joint, thus avoiding the formation of ice on an uncovered part.

The joint is water-tight and will not freeze on the outside. When in operation the pressure of the water being delivered to the tender acts as a lock to prevent easy movement of the spout. The spout locks itself automatically parallel to the tracks when not in use.

The valve is operated by hydraulic pressure controlled by the lever on the spout, no muscular effort being necessary. There are no levers movable or adjustable parts in the valve to get out of order, all operating parts on the entire column being on the outside where they are readily examined, altered or repaired without dismantling the column.

Shutters and Doors

The shutters and doors made by the Variety Manufacturing Company, are briefly described herewith.

The wood rolling shutter is for use on freight and round houses. It is better than the iron door for use on round houses due to the fact that the smoke and other atmospheric gases prevalent in a round house does not in any way destroy the lumber or lessen its durability or life. It is a good door for freight houses, as it can be opened easily, quickly and is always

Water Column.

out of the way. The only objectionable feature is that the glass cannot be installed in the upper half..

The steel rolling door is much like the other steel slat shutters on the market outside of the fact that the construction of the slat makes it a great deal stiffer and stronger. It is better able to withstand the wind pressure and is absolutely watertight.

The cross horizontal folding door is for freight houses, warehouses, and the like, where the openings are out the outside, where iron will in time give way to elements in the weathr and where glass cannot be used in the upper half of wood rolling doors. In the folding door there is glass in the upper half and there is a wooden door, overcoming both of the above objectionable features. In giving glass in the upper half, the transom is done away with, saving money in the construction of the building. It takes up no valuable room when either open or closed, and there is absolutely nothing about it to get out of order. Where it has been used on railroad freight houses, it has given perfect satisfaction.

The double slide-up door is constructed the same as the cross horizontal folding door. It slides vertically, both halves sliding up, one half telescoping the other. In traveling the operating device is so arranged that the bottom half travels twice as fast as the top half, so that when the bottom of the top half reaches the arch of the opening, the bottom half is all the way open also, and the opening is ready for use. This door is easy to operate. Like the folding door there is very little about it to get out of order.

Locomotive Crane

Among the different cranes built by the McMyler Manufacturing Company is the type "B." shown herewith, which is a 15-ton crane with a 2-yard type "S" clam shell bucket.

Locomotive Crane.

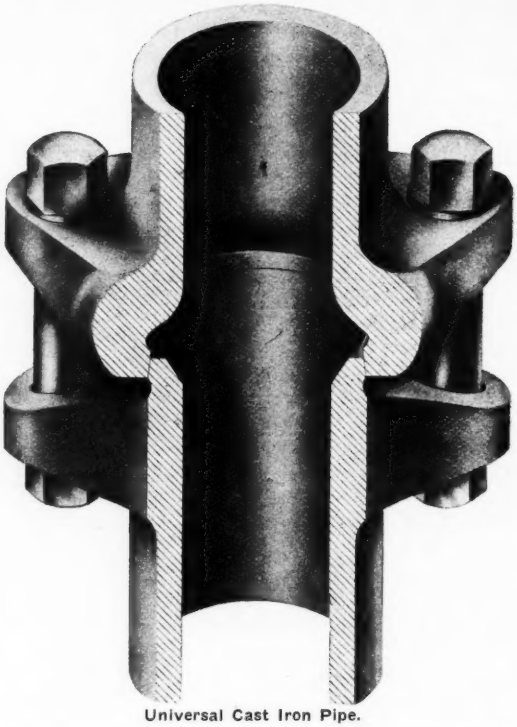
These cranes are eight wheel machines built in 10 and 15-ton capacities. The machine illustrated is provided with M. C. B. trucks and draft rigging, and may be equipped with air brake so as to be coupled into a freight train and hauled over the road.

Cast Iron Pipe

Regarding the Universal cast iron pipe, Julian L. Yale & Company gives the following information regarding improvements and advantages:

By the more advantageous distribution of the metal at the male and female ends the joint has been reinforced and the deflection obtainable at the joint has also been increased without leakage or fracture.

The fittings have been improved. They are now made larger and heavier and have lugs cast upon them, which do away with the loose clamps. Male openings replace, on the fittings where desirable, the female openings of the earlier style. This avoids, except in tying in, the need of close nipples.



Universal Cast Iron Pipe.

The cut shows the Universal joint. The two ends machined male and female on a slight straight taper make up an absolutely tight joint, iron to iron, without packing or gaskets of any kind. This pipe saves the cost of lead and jute and reduces the cost of installing mains, since it can be laid much more rapidly with less labor than can calked joint pipe.

The chief claim of Universal pipe is the practical absence of joint leakage. It is adaptable for the lowest pressures (gas at 4 ounces per square inch), and for the highest pressure (high pressure fire service with a working pressure of 350 pounds per square inch). The Universal Joint iron to iron, forms a homogeneous line and thus, in itself, is a safeguard against electrolysis.

Concerning Signaling

Primary Battery

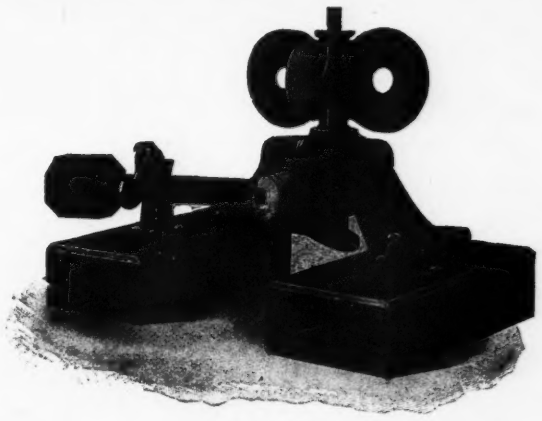
The greatest objection to the closed circuit primary batteries is undoubtedly the time and labor necessary to set up and recharge them. In the improved Gordon cell this objection has not only been overcome, but, by eliminating practically all of the "permanent parts", the cost and trouble of maintaining the battery has been reduced. The advantages which are thus gained will be readily appreciated by all users of batteries. In Gordon cells as now manufactured they have retained all the fundamental principles of their construction and have sought only to simplify them to such an extent that they may be quickly and easily handled—even by those who are not familiar with the use of batteries.

From the following description it will be seen that there are only seven parts to a complete Gordon cell. The copper oxide (or negative element) is used in flake form and is shipped in perforated metal cylinders, the perforations of which are closed in such a way as to prevent leakage in shipment. Attached to the cylinders are three porcelain insulating supports (lugs); upon these lugs the zinc (or positive element) rests, thus preventing it from coming in contact with the copper and forming a short circuit within the cell. The Gordon cell is made by the Lutz-Lockwood Mfg. Co.

Switch Stand

In modern railway practice the devices are receiving first consideration which insure the safety of traffic with a minimum of attention and operating expense. The up-to-date manufacturer of railway appliances conforms to this newer thought and introduces his product by reason of efficient service, rather than first cost. "There is nothing new under the sun," and originality merely to design something unlike that made by others has not been attempted in putting on the market the switchstand shown in the cut. It is, however, a strong and well machined stand, all parts being finished on a milling machine and absolutely interchangeable.

The pinion and shaft, also the gear and shaft, are each in a single malleable casting, thus doing away entirely with the shearing of pins and hammering loose of keys. The shafts are two and one-half times as strong as ordinarily furnished. Reports received from practical railroad men who have given this stand tests under most trying conditions confirm the expectation of the U. S. Wind Engine & Pump Company, of Batavia Illinois, in their endeavor for the best article.



Switch Stand.

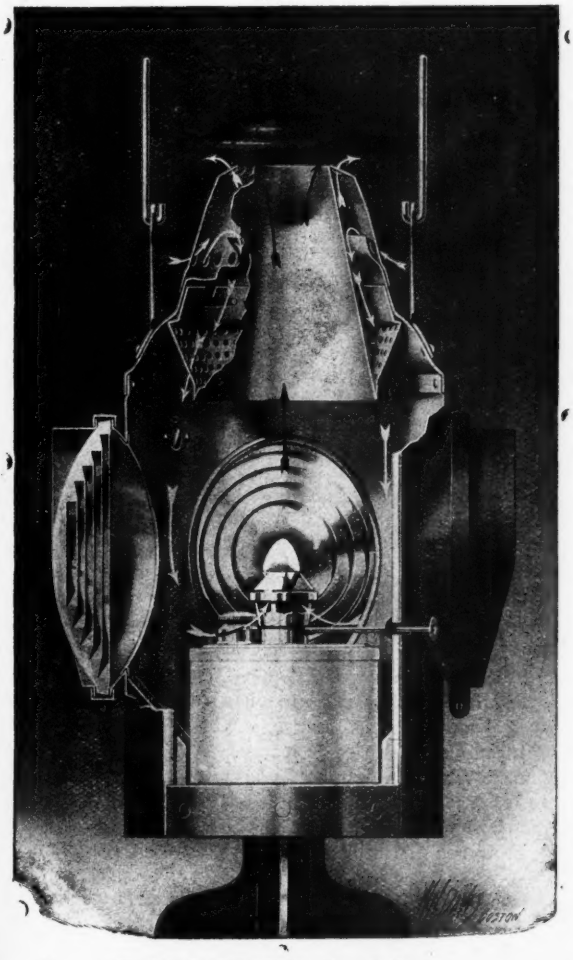
Signal Lamps

The Adams & Westlake Company will exhibit at the Coliseum, Chicago, during the Maintenance of Way convention, their complete line of signal lamps, which covers everything in the railroad field as well as for bridges over navigable streams. They are pioneers in manufacturing lamps of steel construction and are the originators of the non-sweating balanced draught which is now called for in all signal lamps.

A full line of long time burners are manufactured for switch, semaphore and other stationary signal lamps, same being designed to produce either a round or flat flame as desired. Some conditions call for the round flame, whereas others need a wider spread of light, in which event the flat flame burner is used.

Their hand lanterns are made in different styles to meet the various requirements of railway service, and the latest type is fitted with an outside wick raising attachment, which is simple and strong and permits the easy adjustment of the burner flame from the outside of the lantern, making it unnecessary to remove the oil fount for this purpose. This style of lantern is being rapidly introduced.

Switch and signal box locks are also manufactured by them, and there is a great demand for their pressed steel switch lock which is very durable in construction.



Switch Lantern, Peter Gray & Sons.

Switch Lantern

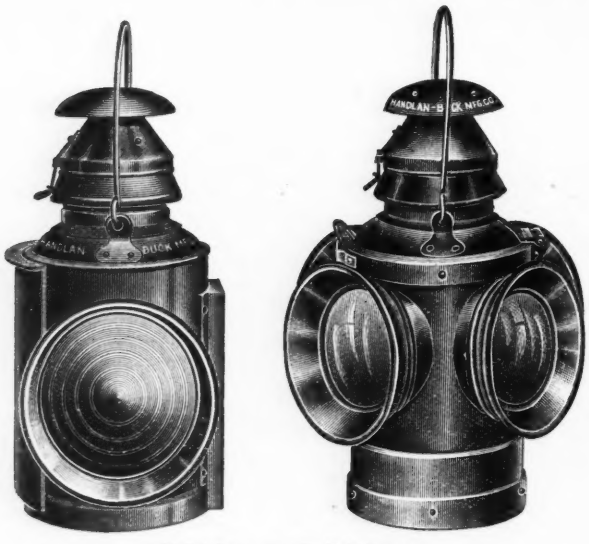
The illustration shows in detail a characteristic design of Peter Gray & Sons' switch lanterns. The entire lantern is made of heavy sheet metal thoroughly tinned after the parts are assembled and riveted. It will be seen that in this particular type of lantern they have installed their new and patented chimneyless burner with long burning fount. This is the burner which, after having undergone many months of accurate and searching tests in one of the leading technical school laboratories, was recently put into general use among railroads to be tested under working conditions. It has already been adopted by several of the leading railroads, and its further introduction is rapidly progressing.

The special features by which a perfectly balanced draft is obtained are clearly seen in the cut. Closely resembling this type in general appearance is a line of semaphore lanterns, also made by this company. These also carry, if required, the chimneyless burner with long-time fount, but both switch and semaphore lanterns are made, as required, for either one-day or long-time burning.

Semaphore and Switch Lamps

The non-sweating semaphore lamp, shown herewith, is manufactured by Handlan-Buck Mfg. Co. It is made of heavy cold rolled steel, retinned, with Handlan ventilation. It has a heavy sliding door, has a peep hole in door and is arranged with or without back light. The burners are either long time or one-day.

The switch lamps are made of heavy cold rolled steel, retinned to prevent rust and then painted with two coats of weather-proof paint. The cold air is properly diffused while entering the lamp; its course is guided through the outer



Semaphore and Switch Lamps.

dome, inner dome and around the smoke bell and enters the lamp proper, at a temperature that absolutely prevents the formation of vapor or commonly known as sweating.

Garrett Bridge Signal

The Garret bridge signal is designed to avoid accidents from fires, highwater and washouts at trestles and bridges. It is positive in action, and has been proved out in actual service on a dangerous trestle during all kinds of weather conditions.

In case of any parts becoming disarranged the signals will automatically assume the danger position. All working parts are gravity actuated and the controlling mechanism is self-contained and may be applied to the stringers of a trestle quickly.

One of the accompanying illustrations shows the details of the signal controlling device. The steel wire attached to the lever connects directly with the signals. The breaking or burning of the tarred rope, which passes through the controlling device and back and forth over all protected woodwork on the trestle, as well as the raising or deflecting of float at the bottom of the float rod, will cause the lever to be released and allow signals to go to danger automatically.

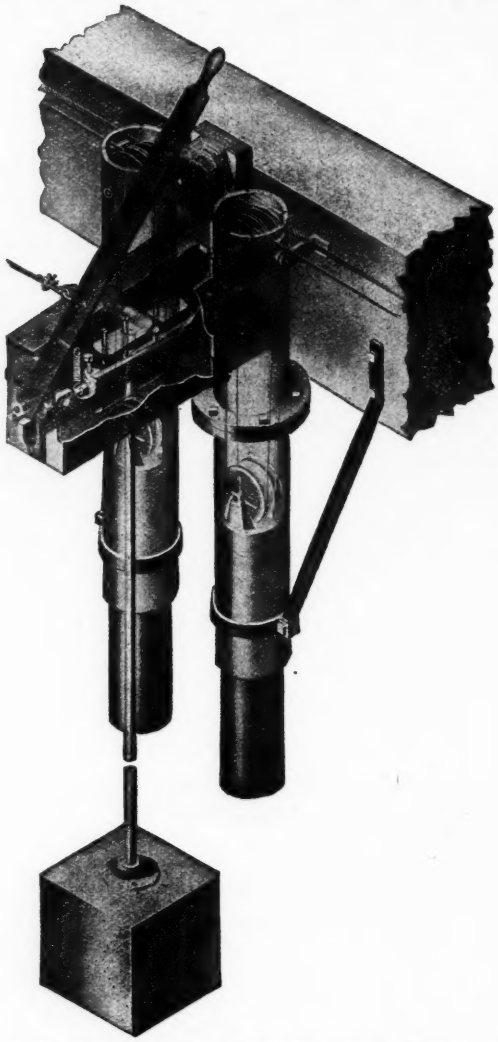
The heavy counterweights within the compensating cylinders serve to keep an even stress on the rope at all times, regardless of contraction or expension due to temperature changes.

The float is adjustable to any height or deflection, and this, together with the adjustable compensating weights for the fire rope, which may be of any length, allows the signal to be used on trestles of any length or height. This signal is made by the Railroad Supply Company.

Concerning Iron and Steel Structures

Paint for Protection of Metal

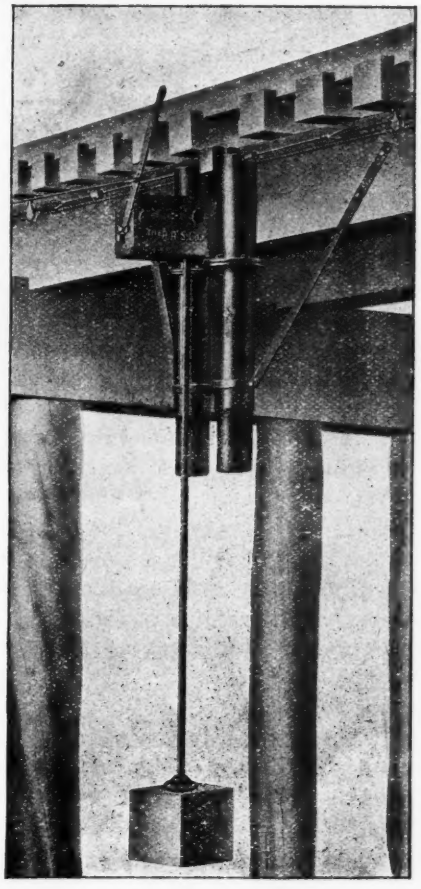
A great deal has been said about the proper and complete protection of exposed metal work in railway service. Various opinions have been advanced, some based on theory and others on special tests under circumstances favorable and otherwise with application of paint on clean and rusty surfaces, also on galvanized metal. Most of these experiments have been made by coating pieces of the metal which were exposed and attached to sides of buildings, subjected to conditions varying with weather changes to which may be added the direction and force of the



Garrett Signal Controlling Mechanism, Showing Mechanical Construction.

wind to increase the severity of the test. These tests are not complete, and of value only as far as they go. The samples as we might call them are stationary and exposed on one side only —the weather side. There is no vibration to test the tenacious quality of the paint applied as in the case of bridges which are subjected to violent shaking up on passage of the ponderous weight of the railway equipment of the present day. Bridge metal is exposed and subject to attacks from all sides and paint applied thereon must not only withstand the destroying effects of the various weather conditione but must be sufficiently elastic not only at time of application, but must retain that very necessary quality in order to fully protect against vibration with expansion and contraction of the metal resulting from extreme heat of summer and rigorous conditions of winter season. Taking everything into consideration, the numerous opinions based on theory and tests in actual service, with results obtained therefrom it would seem that the preparation which will flow readily from the brush and cover evenly the greater surface, dry firm within reasonable time, and retain its elasticity under the numerous destroying agencies for an indefinite period would be the better protection and consequently the most economical for the consumer.

In this connection the Wadsworth-Howland Company say that they have manufactured and sold largely to important railway companies the metal preservative (Carburet Black) for the past



Garrett Signal Controlling Mechanism, Bolted to Stringer.

twenty years with gratifying success and with evidence of its unusual durable quality. These goods combine all the good qualities necessary to a good paint and are recommended without reservation for all general protective purposes.

Crysolite Protective Paint

Crysolite protective paint has been used for protecting iron and steel against the varying climatic conditions of Canada, Mexico, Boston and San Francisco. It is designed for use upon all forms of iron and steel which are exposed to the weather and severe conditions. It can be used successfully over red lead or any linseed oil paint which is thoroughly dry and hard, but must not be used over fresh linseed oil paint.

Solvay hydraulic paint is used on bridge-floats, steel flumes, pipes, pumps and submerged work, whether exposed to salt or fresh water. It is a coating for steel girders which are to be embeded in concrete, as it is untouched by free lime in the cement and is impervious to moisture and carbonic acid. These paints are made by the Semet-Solvay Company.

Protecting Piles from Marine Insects

Frequently, and entirely too frequently, the engineers of this country are confronted with what are supposed to be glaring examples of the failure of creosoted piling, especially where such work has been used for marine construction. This most prominently has been the condition on the Pacific coast, where it seems the average creosoted piling has been a profound failure, and all such failures are committed in the name of creosoted piling.

Between the mainland and Galveston Island, there is a single-track bridge built on piling with a draw in the center. The piling for this bridge were treated by the International Creosoting & Construction Co. The piles were all of the southern pine, treated with 24 pounds of anhydrous creosote oil. They were practically all green when treated, most of them coming direct from the stump and seasoned by a steaming with the same process and methods as are now in vogue by that company. As in the case of thoroughly impregnated piles, they would sink if allowed to fall in the water, an experiment which cost the pile-driver several sticks of piling.

At the time when this bridge was built there was a certain disregard for the economic usefulness of creosoted piling, and the International Creosoting & Construction Co. was so completely certain of the lasting qualities of its own work that it gave a 10-year guarantee on the bridge in question, promising to replace any stick of piling which at the end of 10 years showed any traces of decay or deterioration of any character. The bridge was built in 1895. In 1905, when the official inspection was made in anticipation of its final acceptance, not one stick of piling had to be replaced. This condition of affairs was exceedingly satisfactory to all concerned, first to the treating company as proof of its own successful work, and secondly to the railroad company as an evidence of the fact that creosoted piling, when honestly and thoroughly treated, are barred from the teredo, and that a railroad built on such a structure is not a menace to the lives of the people who travel over it daily.

This instance of creosoting piling has certain points that ought to be a reason for those engineers or other professional men who are prone from many instances of the failure of such work to reconsider their judgment on the subject of availability of creosoted piling for marine construction. There were just three things that were of special importance in treating the piling for this bridge:

First, the timber itself. It was freshly cut, and consequently there was the minimum likelihood of any decay being present in the piling previous to treatment.

Second, a high grade of oil was used. It was a London oil of a good specific gravity, of an average amount of naphthalene, and of a good percentage of anthracene oils.

Third, and most important of all, was the assurance that each charge of piling received the required amount of oil per cubic foot. Therefore it brings the question of creosoted piling down to the basis of having good timber, absolutely free from all signs of decay, of a high-grade oil and of a sufficient guaranteed quantity.

Protective Paint

During the past ten years many chemists, manufacturers of paint, builders of structural iron and steel work and railway engineers, have been experimenting in the hope of discovering a perfect protective coating for exposed structures. However, they have not succeeded as yet in producing what may be termed a perfect protective paint for iron and steel.

Good pigments are common, but most binders heretofore known have been too perishable to contribute to the durability of paints, for the reason, perhaps, that more attention has been given the former. The binder, however, should be of equal importance because its purpose is to cement together the minute particles of the pigmentary constituents, thus resisting the ever-active corrosive agencies of oxygen, solar heat, acids and water, which in time destroy the linseed oil. With the disintegration of the film the rust-producing elements penetrate to a corroding contact with the underlying metallic surface, and therefore to provide a protective coating for iron and steel that will defy the action of corrosive elements for the longest time has been the aim and effort of many experimenters.

The Fibrous Paint Company, of Philadelphia, claim a protective coating that keeps these disintegrating forces successfully at bay. This company and its predecessors have experimented through a period of more than twelve years.

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The Maintenance of Way Convention

THE tenth annual convention of the American Railway Engineering and Maintenance of Way Association will be held as usual at the Auditorium Hotel, Chicago, on March 16, 17 and 18. The committee reports for this year are very complete and almost every committee has recommendations for standard practice. It is well known the convention of last year was better attended than any previous one, all the important roads being represented and in most cases with the heads of the departments. The importance of the reports to be considered at this convention should draw even a larger number of engineers.

The report on Roadway takes up again the question of track elevation and depression inside of cities, the best method of determining the size of water-ways, the subject of slides and washouts, the subject of surface and sub-surface drainage, and the tiling of wet cuts. Conclusions are presented on water-ways, slides and washouts, etc., which the committee recommends should be included in the Manual of Recommended Practice.

The committee on Ties presents a report containing a compilation of statistic on the life of ties, a study of the question of timber supply, and a review of metal and composite ties which are being used. The committee on Buildings considered questions regarding coaling stations and storage bins, the use of concrete roofs for roundhouses, best methods for smoke removal, ventilation and heating of roundhouses, and the design and arrangement of oil houses at terminals.

The committee on Iron and Steel Structures presents a progress report on impact tests and also a report on maintenance of bridges including protection from corrosion. A sub-committee reported on the question of flat spots on car wheels, the report being contained in Bulletin 106 of this association.

The committee on Signaling and Interlocking presents a report on aspects, standard contract, switch stands, revision of manual and standard designs. The report covers 165 pages of Bulletin 108. A special committee on Uniform General Contract Forms presents a report including definitions, elements of a binding contract, and components of a uniform general contract form.

The committee on Masonry reports on the failures of concrete structures and causes for same, the use of reinforced concrete trestles with typical designs and costs, plans for retaining yards and abutments, monolithic construction and specifications for concretes.

The report of the committee on Track covers a revision of last year's report, the subject of turnouts and turnout material, facing point switches and switch stands. Following conferences with a sub-committee of the American Railway Master Mechanics Association recommendations are made for standard flangeway and gage of track.

The work of the committee on Wooden Bridges and Trestles consists of a revision of the specifications for structural timber, the preparation of a list of safe unit stresses for same, names of structural timbers, study of the principles and methods of pile driving and the method for the classification of pine timber.

A new committee of this association which is taking up the subject of wood preservation gives a review of the investigations and reports on the preservation of wood, covering statistics, preservatives, adaptability of woods and treating processes.

The committee on Ballasting in its report covers the preparations and delivery of ballast and the advantages and disadvantages of the variuos types of ballast. The appendixes to the report contain physical tests of ballast stone, and the characteristics of stone ballast used on the Big Four Railway.

The committee on Water Service takes up the question of the relative economy of different fuels used in pumping water, the general principles of water supply service with typical installations, and the discussion of track tanks with specifications for typical installations.

The committee on Records, Reports, and Accounts considered a revision of the "Track chart," conventional signs, and a review of the subject of time books. The committee on Signs, Fences, Crossings and Cattle Guards presents recommendations on gates for

right-of-way fences, a report on the construction of grade crossings, snow fences, snow sheds, and snow plows, and on the use of concrete fence posts together with the designs and estimates of cost.

The committee on Uniform Rules presents a supplement for the general rules for the government of employees of the Maintenance of Way department and special rules for foremen and other employees.

The committee on Yards and Terminals considered thoroughly the question of hump yards and also the use of machinery for handling freight. An appendix to this report gives the details of operation of hump yards on twenty-eight roads.

The work of the committee on Rail consists of the investigation of breakage and failure of rails, recommended changes in specifications for Bessemer steel rails and specifications for a standard drop testing machine.

Spiking and Gauging Track

(Continued from page 47)

and these adzed off, the other two men doing the gauging proper, driving down the spikes in the old holes wherever possible.

Often there are particular pieces of track that become troublesome and require gauging more frequently than others. In cases of this kind, like sharp curves or soft places in the roadbed, the only effectual remedy is the use of tie plates. No progressive railroad man will any longer dispute the fact that the use of tie plates prolongs the life of the tie and assists greatly in holding the track to gauge. The whole question has now been condensed to the type of tie plate to be used. That used by our company is known as the P. R. R. Combination and has many points of merit, two of which appeal particularly to trackmen; viz., the easy manner in which the plate can be applied to the ties and the fact that the same may be used on either intermediate or joint ties, as the case may be, simply by reversing the plate.

We have gone a step further with this particular type of tie plate, and, instead of carryingg a stock for each weight of rail, we have had one of the inside slots of the tie plate—say for 100-lb. rail—lengthened, so that the plate will fit any weight rail from 70 to 100 lbs. This means the carrying of a smaller stock of plates on hand and allows for heavier weight rail renewal without purchasing additional tie plates for the different weights of rail.

Yours truly,

Pennsylvania. R. O.

Relaying Rails

Editor, Railway Engineering:

In my opinion the best way to relay rails is to place one rail at a time in the track in position. Have some of the men go ahead and thin out the spikes—say pull two and leave one, but not thin out the bolts from the old rail, but move the old rail out on the end of the ties. Adze the ties and drive down the stubs and lay the new rail on level bearing. Use steel expansion shims according to weather and put in two bolts. Use track gauge and spike every second tie and have men follow up and fully bolt and take out the expansion shims and spike the track in full.

Use a switch point for temporary connection, but this point should not be left in the track over night. In my experience in relaying rails, I find that by laying one rail at a time you get better results. The expansion is even and the rail has a level bearing. When the men get accustomed to lay rail in this manner they will do good work and also make good headway. The foreman in charge should see that the new rail is fully bolted and spiked in full and the old rail cut for connection for the night.

The method of bolting rails up on end of the ties and moving it into place with bars, I do not approve of, as you either tighten or loosen the expansion. If possible to do so, renewing rail should be done in warm weather. Then the rail can be laid up tight. As expansion is very important, great pains should be taken to get the proper expansion and by getting it the results will be better.

Yours very truly,

Minnesota. T. B.

Telephone for Train Dispatching

The use of the telephone for train dispatching was discussed thoroughly by W. E. Harkness, engineer of the Western Electric Company, in a paper presented before the St. Louis Railway Club and given in the February proceedings of the club. He outlines what has been done in this field and explains the advantages of the telephone for this class of service.

Natural Resources

A joint meeting of the four national engineering societies is to be held at New York to consider the subject of conservation of natural resources. "On Wednesday evening, March 24, 1909, the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers, will hold a joint meeting in the auditorium of the Engineers' Building, New York. The topic to be discussed is the Conservation of Natural Resources. A representative from each society will present a paper in regard to some specific feature of this vital economic problem. All four societies have announced the names of their representatives and the titles of the papers to be presented. The authors and titles are: 1—American Society of Civil Engineers—"The Conservation of Water," by John R. Freeman; 2—American Institute of Mining Engineers—"The Conservation of Natural Resources by Legislation," by Rossiter W. Raymond; 3—American Society of Me-

chanical Engineers—"The Waste of Our Natural Resources by Fire," by Charles Whiting Baker; 4—American Institute of Electrical Engineers—"Electricity and the Conservation of Energy," by Lewis B. Stillwell."

Cuyahoga Valley Viaduct

In the transactions of Cleveland Engineering Society, a paper by George H. Tinker, bridge engineer of the New York, Chicago & St. Louis Railroad, on the Cuyahoga Valley Viaduct of the Nickel Plate Railroad is printed. The paper covers the design of the viaduct in a general way and more particularly the construction of the bridge with a description of the methods employed.

Railway Business Association

The Railway Business Association, 2 Rector street, New York, issued a pamphlet which gives a story of four months' accomplishment. One important quotation follows: "Shall the Railway Business Association live and thrive and be a power in bringing about a betterment of conditions affecting railways? That will depend upon the support given it by those who depend upon the prosperity of railways for their own prosperity."

Standardization, Rock Island-Frisco System

The Chicago, Rock Island & Pacific and St. Louis & San Francisco lines, including the Chicago & Eastern Illinois and the Evansville & Terre Haute railways have issued circulars, announcing the appointment of a standardization committee for the entire system whose duties will be to promote uniformity and economy in the use of supplies and equipment of all kinds, as well as in various methods of procedure. These will be made to conform as closely as possible on all of the roads. The committee is composed of A. S. Grieg, assistant to Chairman B. F. Yoakum of the executive committee, and Edward S. Moore, second assistant to President Winchell. The headquarters of the committee will be in Chicago and Mr. Grieg, who is chairman, will spend a large part of his time there instead of in New York.

Electrification, German Railroads

The change to electricity at the motive power in both passenger and freight service has been studied by German Engineers. Writing from Chemnitz, Consul Thomas H. Norton discusses the proposition, as given in the consular reports, as follows: The technical problems connected with the safe and economical transmission and application of the electric current have, one after the other, been satisfactorily solved. The decisive experiments in 1903, conducted by the Prussian railway authorities in connection with the General Electrical Company, on the line between Niederschönweide and Spindlersfeld, showed conclusively that the proper motor had been devised to use effectively the alternating current, which alone can serve for the transmission on a single conductor of high-tension currents.

Since then no material advance has been made from the mechanical standpoint, nor has much been required of the electrical inventor. The new motors have rendered admirable service when utilized for urban and suburban traffic, and when applied on short lines. It is now a purely economic question whether the time has arrived to discard the time-honored steam locomotive after its eighty years of faithful service and replace it by the electrical locomotive as sole motive power for extensive railway systems.

Trade Notes

The McClintic-Marshall Construction Co., Pittsburg, Pa., has opened an office in the Central building, Seattle, Wash. Mr. C. F. Boyce is the sales representative in charge.

The Browning Engineering Co., Cleveland, Ohio, has appointed Mr. J. R. Traver representative at Denver, Colo., and Mr. R. I. Wiswell representative at Atlanta, Ga. They will deal in locomotive cranes, revolving steam shovels, railway ditchers, railway wrecking cranes, buckets and magnets.

The G. & C. Merriam Company, Springfield, Mass., recently sent us circulars descriptive of Webster's International Dictionary: "Webster's 'Unabridged' is old but is still of some use. The real Webster is Webster's International Dictionary, published in 1890 and revised and brought up to date in 1900. It is published by G. & C. Merriam Company. This last edition is the equal of the highest achievement in dictionary making. Although there have been other splendid dictionaries published in the last fifteen years, Webster's is still the authority. I should say that authority is the chief basis of its work."

Mr. J. F. Hinckley, chief engineer of the St. Louis & San Francisco, has resigned to engage in private practice as a consulting engineer, with offices in the Syndicate Trust building, St. Louis, Mo. Mr. Hinckley is a member of the American Society of Civil Engineers, the American Railway Engineering & Maintenance of Way Association, and the Engineers' Club of St. Louis.

The Williams Boltless Rail Joint Manufacturing Co. has been organized to make and sell the Williams boltless rail joint, with headquarters at 1202 Great Northern building, Chicago. The officers are: Messrs. Frank Williams, president; Frank Condren, vice-president; W. M. Clark, secretary and treasurer; Willis D. Williams, general manager; Emil Meyer, assistant manager.

Mr. David J. Evans, manager of sales of the Chicago office of the Rail Joint Company, New York, has resigned, effective March 1, and will give his personal attention after that date to the interests of the Andresen-Evans Co., Chicago, in which company he has been interested since its organization. Prior to his association with the Rail Joint Company, Mr. Evans was for a number of years connected with the Chicago office of the Lorain Steel Co., and also the North American Railway Construction Co. The Andresen-Evans Co., as engineers, has developed new types of ore and coal unloading and conveying bridges, grab buckets, etc.

Mr. J. A. Foulks, 29 Broadway, New York, has been appointed eastern representative of the Indianapolis Switch & Frog Co., Springfield, O., maker of frogs, switches, crossings and special track material for steam and electric railways, industrial, mining and smelter tracks.

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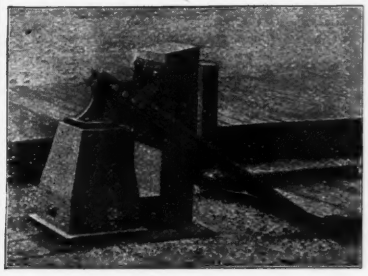

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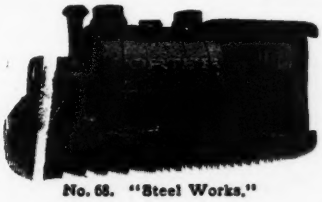
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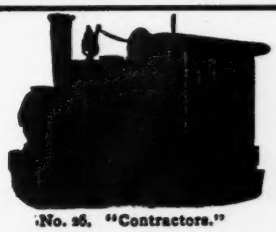
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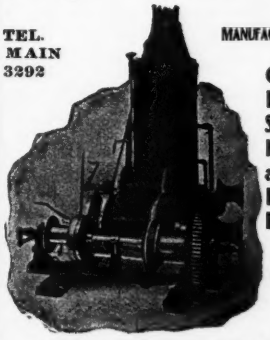

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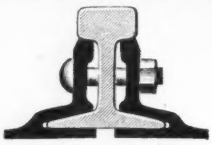

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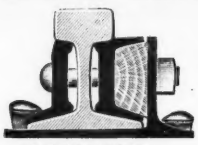

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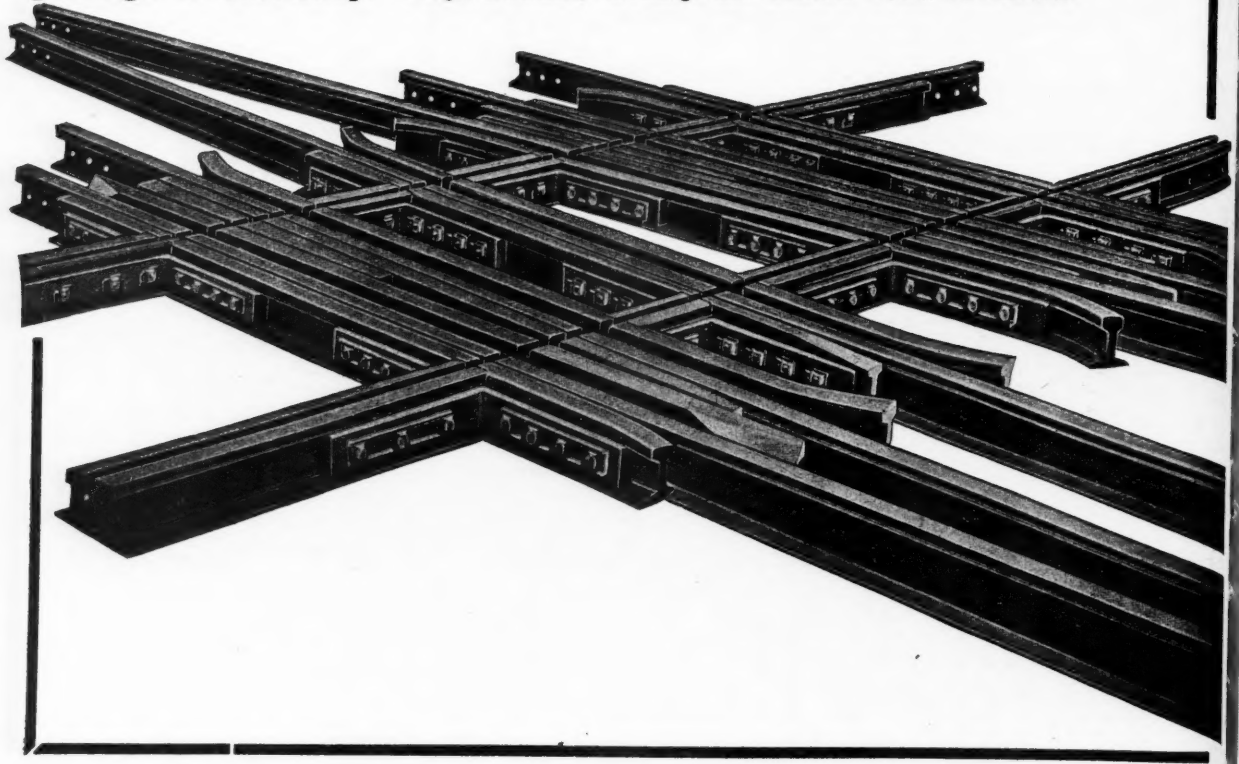

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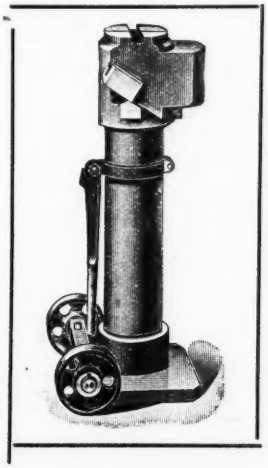

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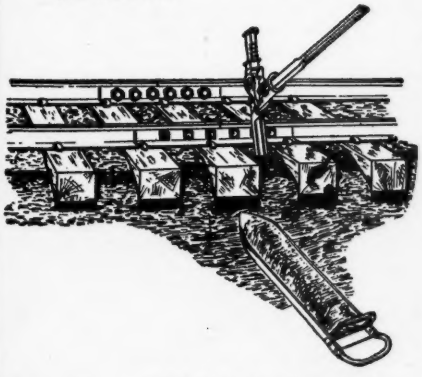

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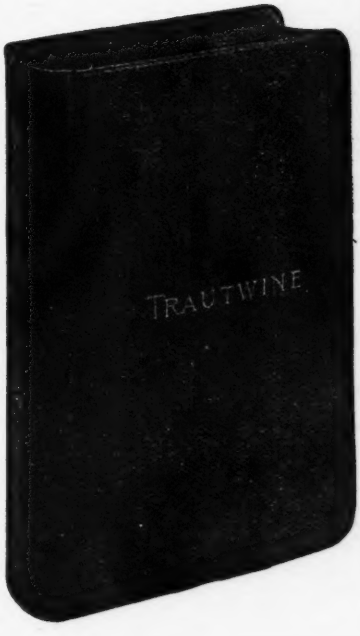

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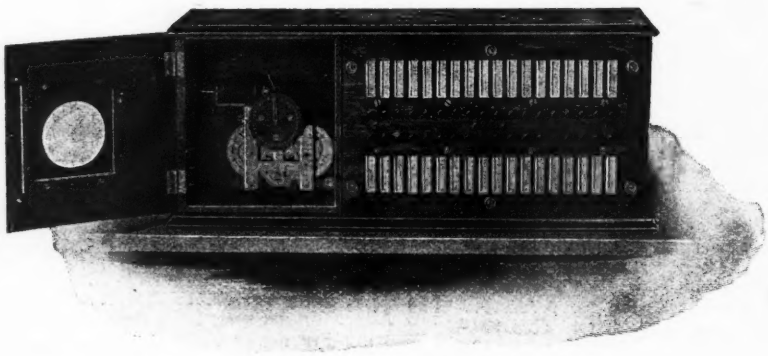

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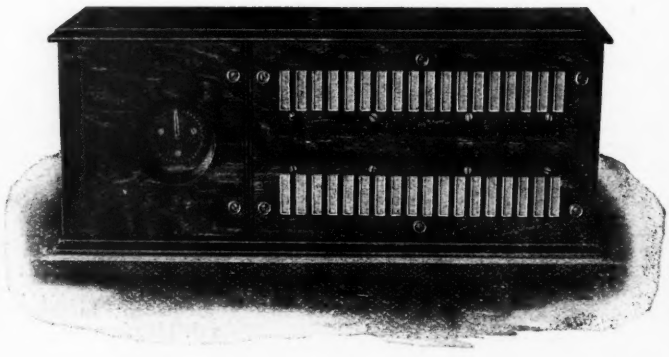

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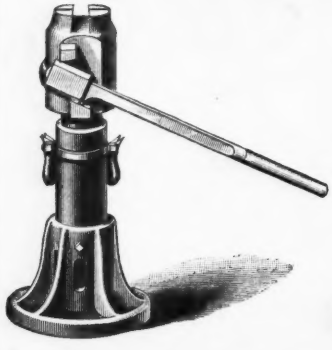

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